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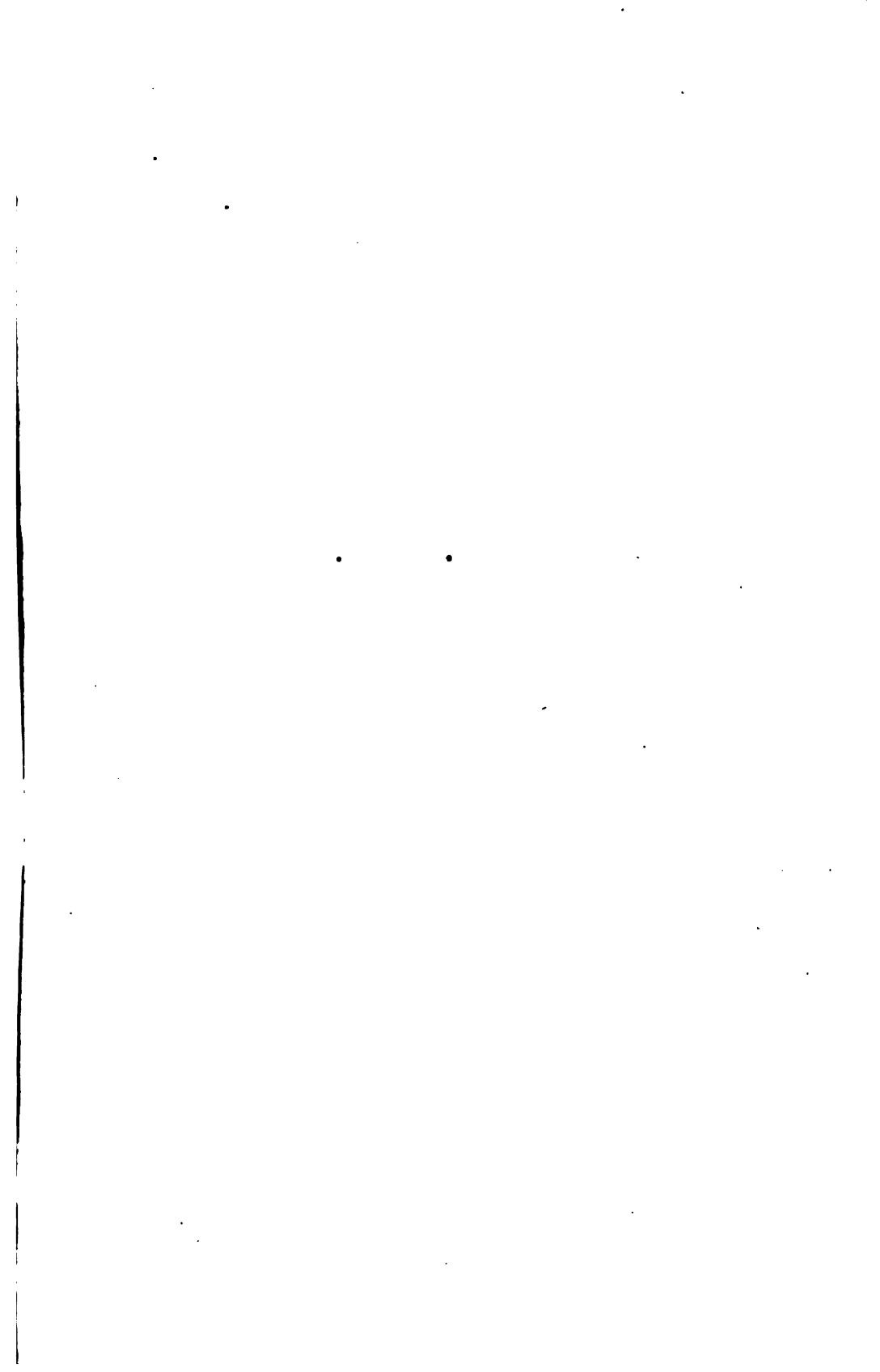
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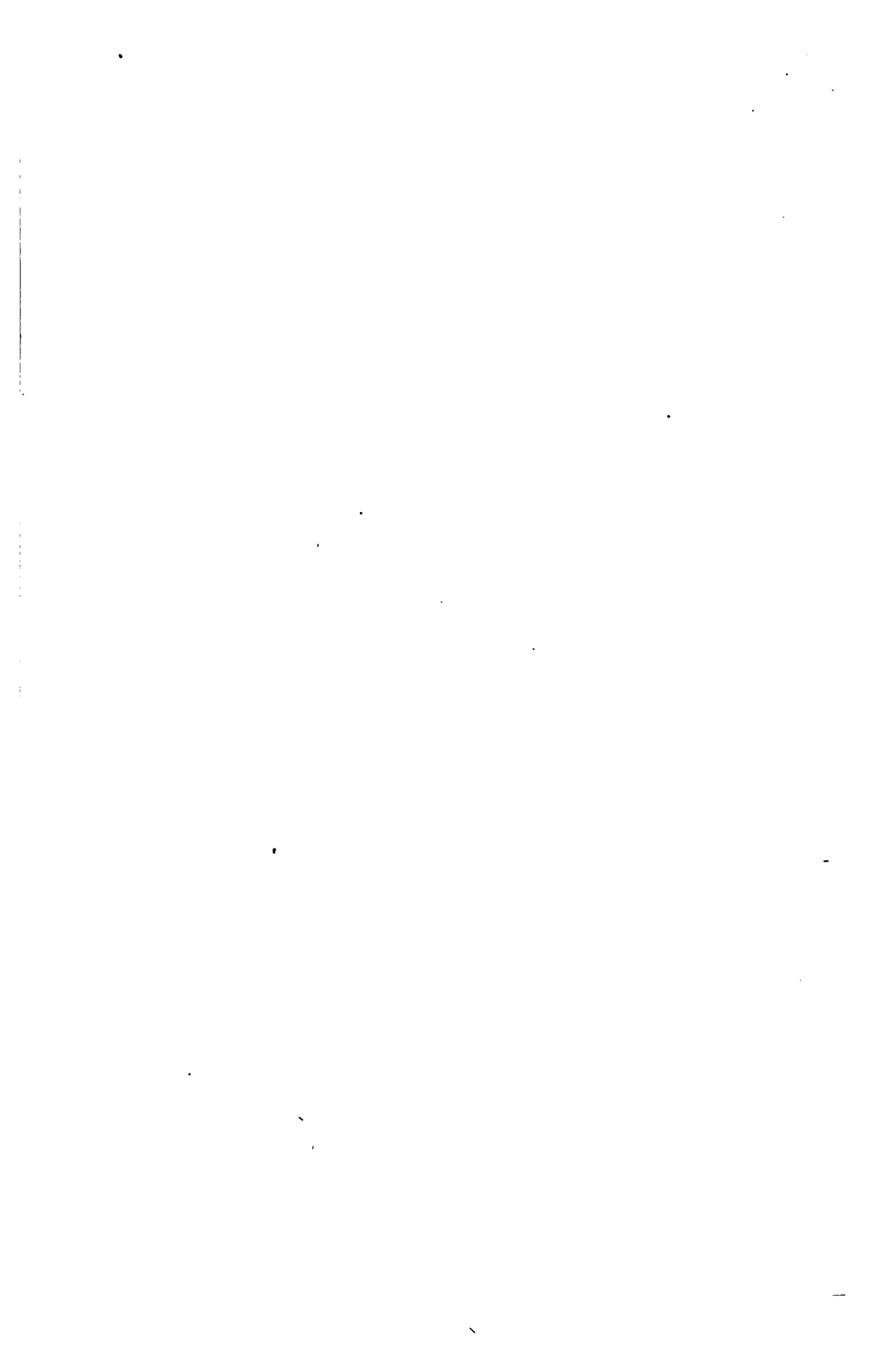
FROM THE

UNITED STATES GOVERNMENT











H. O. No. 165

PACIFIC ISLANDS PILOT

Volume I

(WESTERN GROUPS)

1916

U.S. —
PUBLISHED BY THE HYDROGRAPHIC OFFICE
UNDER THE AUTHORITY OF THE
SECRETARY OF THE NAVY



WASHINGTON
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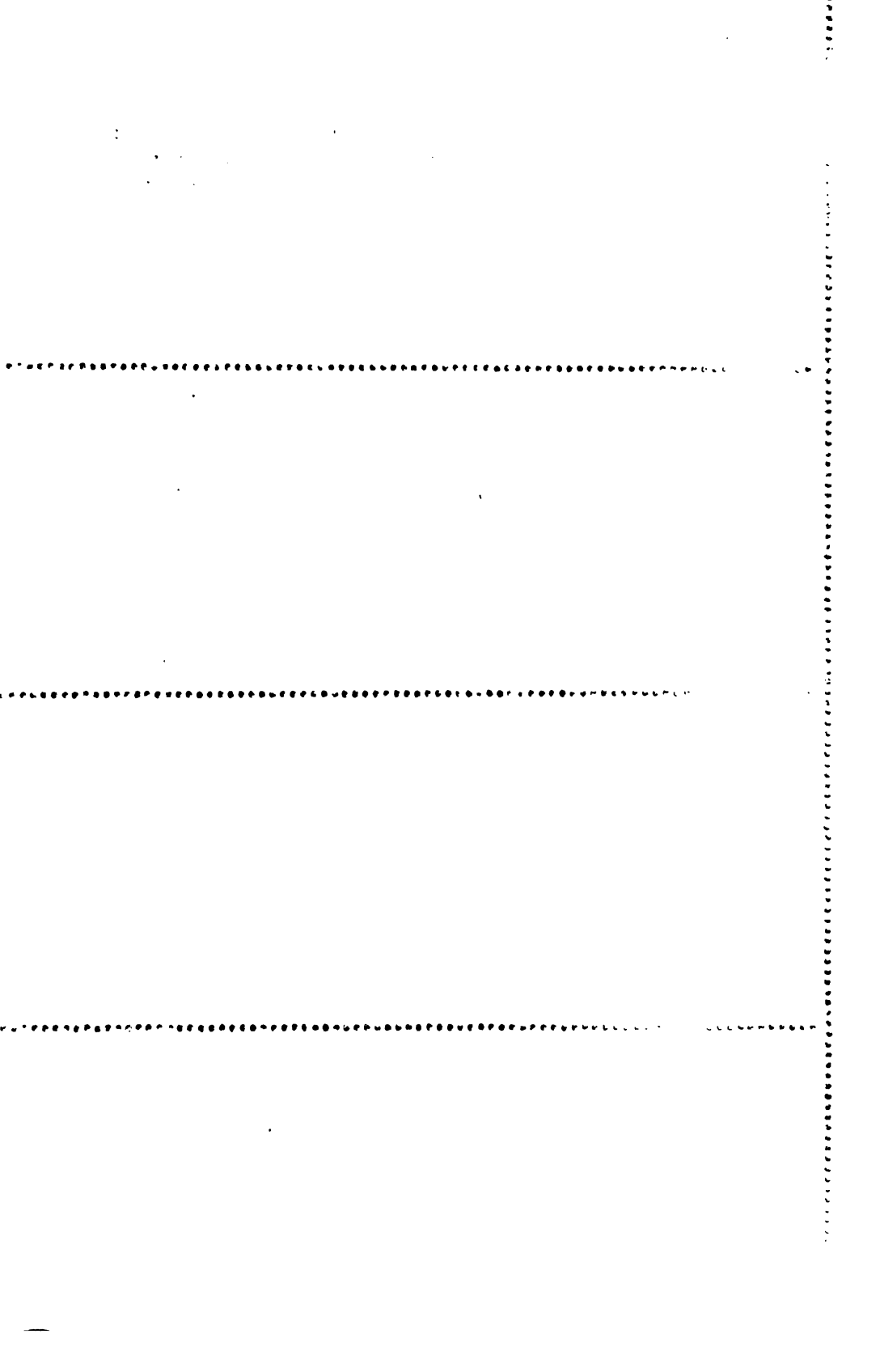
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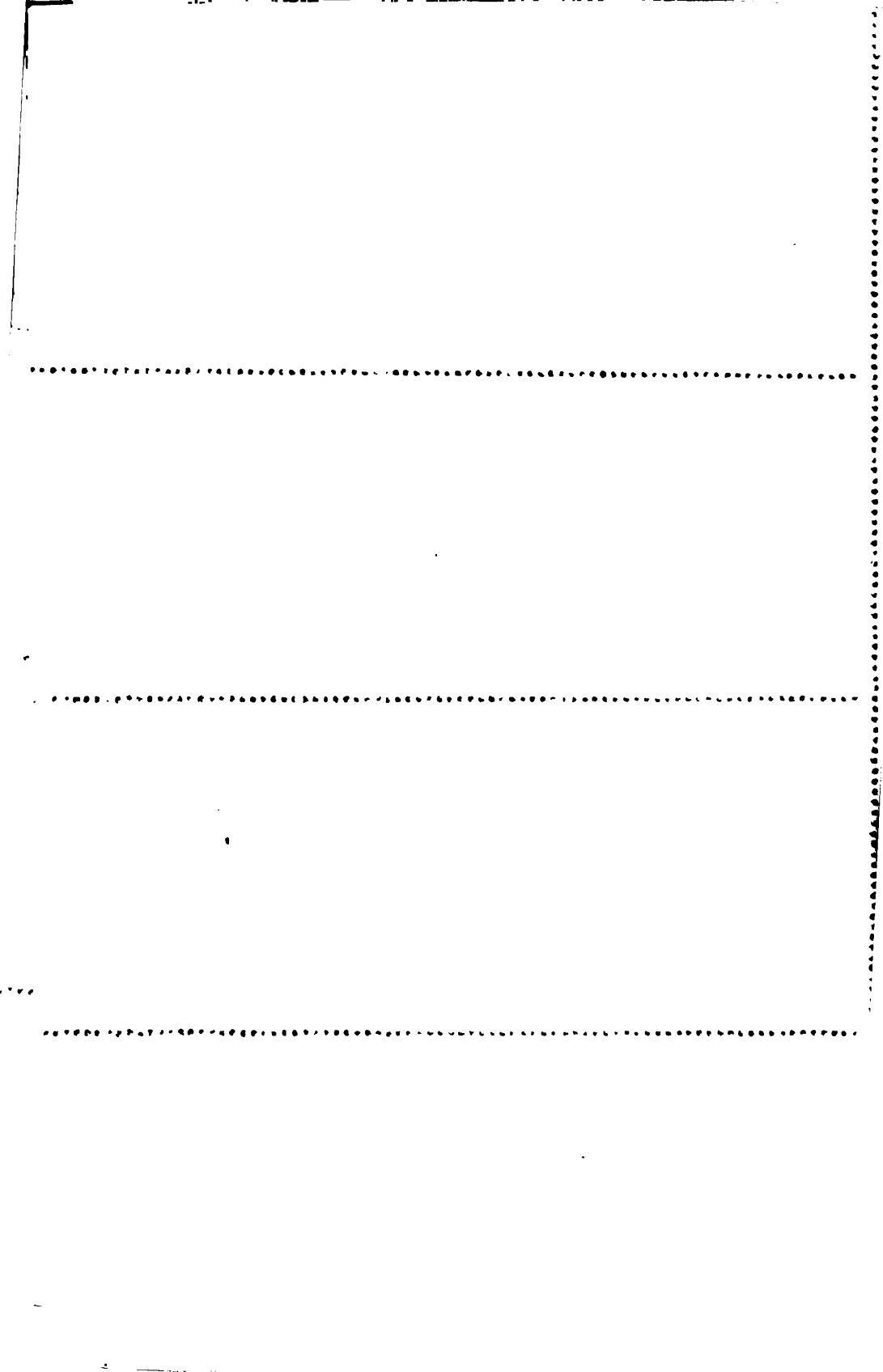
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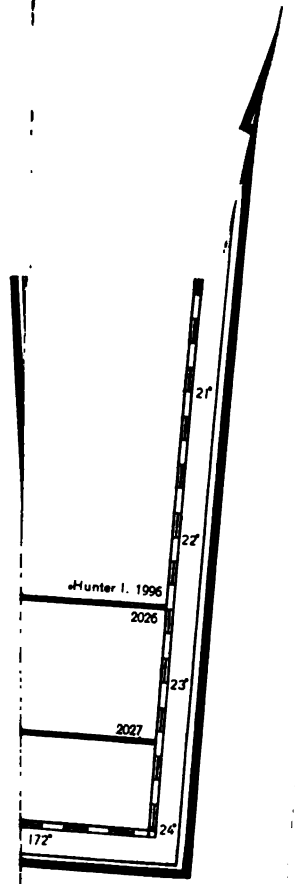
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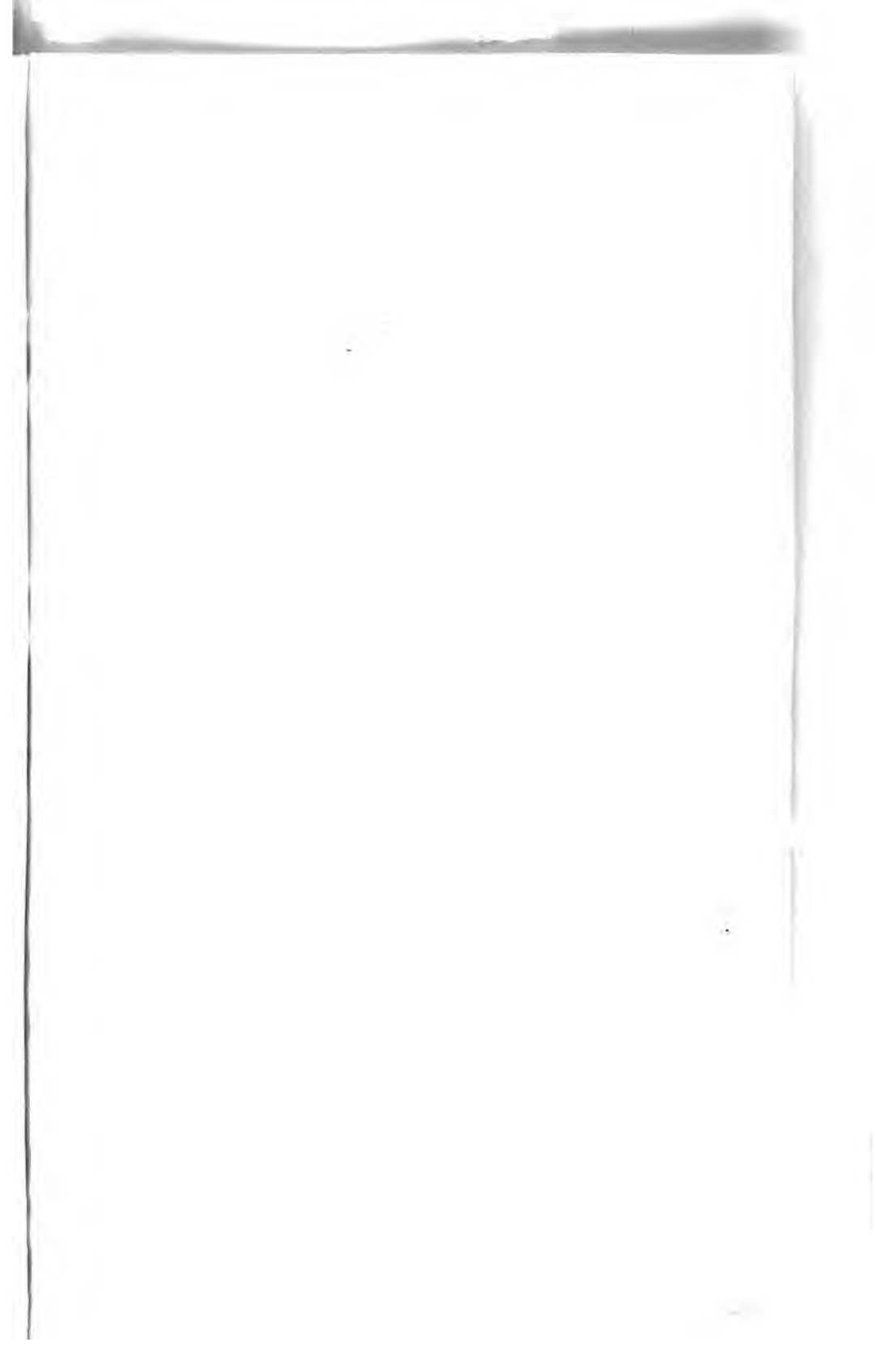
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P R E F A C E .

This publication comprises the sailing directions for the following island groups: New Caledonia, Loyalty, New Hebrides, Santa Cruz, Solomon, Neu Mecklenburg, Neu Pommern, Admiralty, Palao, Marshall, Caroline, and the Marianas. It cancels all Notices to Mariners up to and including No. 3 of 1916.

The information contained in this work has been compiled principally from the Pacific Islands, Volume I, and Pacific Islands, Volume II, published by the British Admiralty. It contains much data obtained from the surveying expeditions of the United States Navy, from large numbers of reports furnished this office by the consular officials, and officers of the Navy and merchant marine.

The bearings and courses are *true*, and are given in degrees, from 0° to 360°, commencing at north and increasing to the right.

Bearings limiting sectors of lights are toward the light.

The directions of winds refer to the points from which they blow; of currents, the points toward which they set. These directions are *true*.

Variations, with the annual rate of change, may be obtained from H. O. Chart No. 2406, Variation of the Compass.

Distances are expressed in nautical miles, the mile being approximately 2,000 yards.

Soundings are referred to low water ordinary springs.

Heights are referred to high water spring tides.

The latest information regarding lights, their characteristics, sectors, fog signals, and submarine bells should always be sought in the light lists.

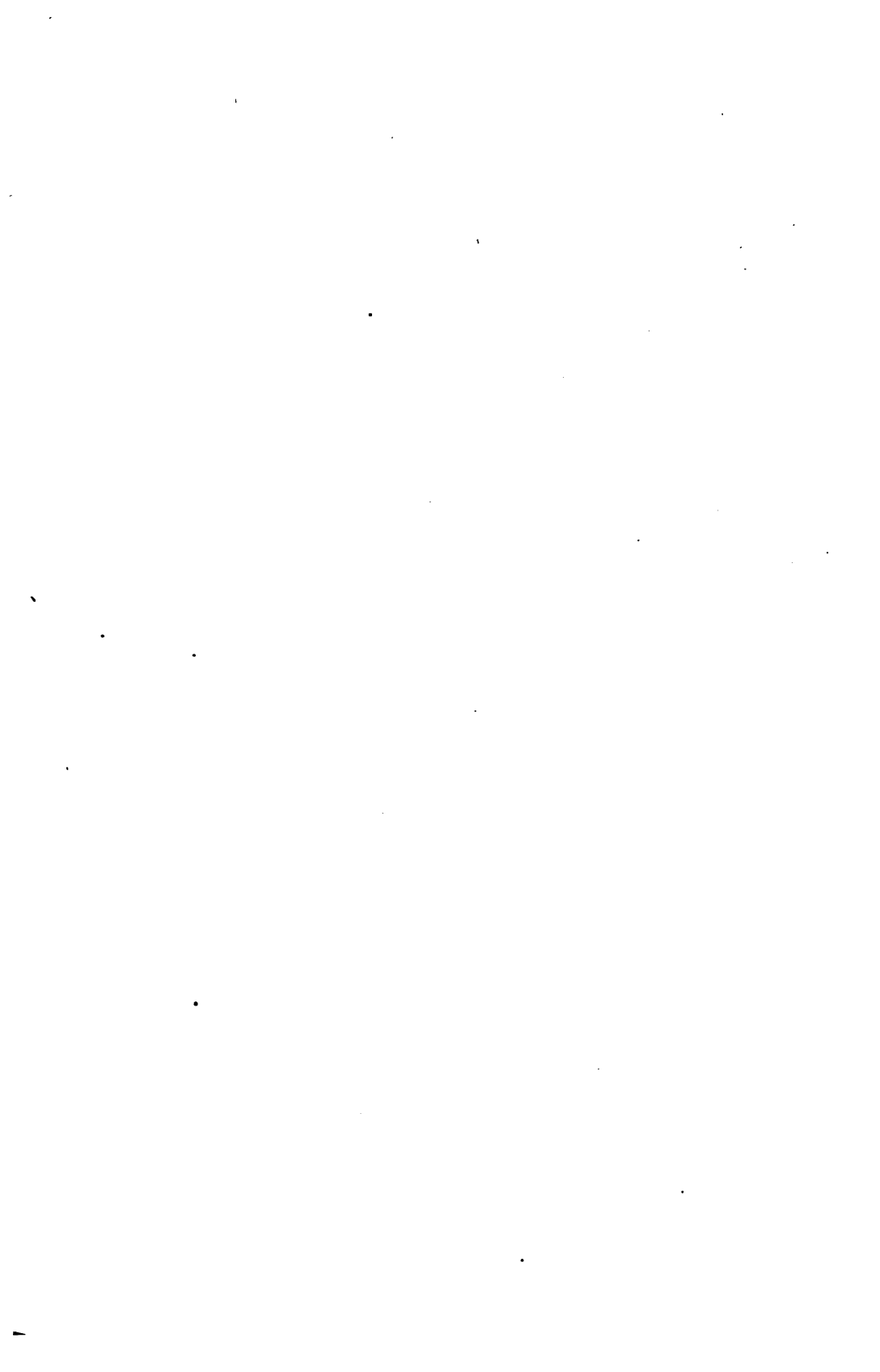
Attention is invited to the coupons on the first pages of this book, which entitle the purchaser to a summary of the Notices to Mariners affecting this publication. They will be ready for distribution as soon as practicable after the first of each year, beginning January, 1917.

Mariners are requested to notify the United States Hydrographic Office, directly or through one of its branch offices, of any new information obtained, or of any errors or omissions discovered in this publication.



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INFORMATION RELATING TO NAVIGATIONAL AIDS AND GENERAL NAVIGATION.

THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

The following publications are issued by the United States Hydrographic Office as guides to navigation: Charts, Chart Catalogues, Sailing Directions, Light Lists, Tide Tables, Notices to Mariners, Pilot Charts, and Hydrographic Bulletins. Of these, the Notices to Mariners and the Hydrographic Bulletins are free to mariners and others interested in shipping. The Pilot Charts are free to contributors of professional information, but are sold to the general public at 10 cents a copy. The other publications of the office are sold under the law at cost price.

The Charts, the Sailing Directions, and the Light Lists are all affected by continual changes and alterations, concerning which information from all parts of the world is published weekly in the Notices to Mariners.

The charts are always corrected for all available information up to the date of issue stamped upon them; and the Light Lists should be noted for the recent alterations and additions. The Sailing Directions, however, can not, from their nature, be so fully corrected, and in all cases where they differ from the charts, the charts must be taken as the guide.

Charts.—When issued from the Hydrographic Office, the charts have received all necessary corrections to date.

All small but important corrections that can be made by hand are given in the Notices to Mariners, and should at once be placed on the charts to which they refer.

Extensive corrections that can not be conveniently thus made are put upon the plates, and new copies are put on sale. Masters of vessels are urged to replace the old charts, which should be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which extensive corrections are made are noted on the chart on the right of the middle of the lower edge; those of the smaller corrections at the left lower corners.

The edition, and corresponding date, of the chart will be found in the right lower corner, outside the outer neat line.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (found in the lower right and upper left corners), in order that the edition of the chart referred to may be known.

The Light Lists are corrected before issue, and all changes are published in the weekly Notices to Mariners.

The navigating officer should make notations in the tabular form in the Light Lists and paste in at the appropriate places slips from the Notices to Mariners.

The Light Lists should always be consulted as to the details of a light, as the description in the sailing directions is not complete, and may be obsolete, in consequence of changes since publication.

The Sailing Directions or Pilots are kept corrected by addenda; and subsequent to date of last addenda, they should be kept corrected by means of the Notices to Mariners. Sailing Directions issued to naval vessels carry with them an envelope containing slips of corrections up to date of issue.

Addenda are published from time to time, and contain a summary of all the information received up to date since the publication of the volume to which they refer, canceling all previous Notices to Mariners.

To enable the books to be more conveniently corrected, addenda and Notices to Mariners are printed on one side only, and two copies of the latter are issued to each naval vessel, one to be cut and the slips pasted in at the appropriate places, the other to be retained intact for reference.

To paste in the slips, as the Notices to Mariners are received, is one of the duties of the navigating officer, demanding faithful attention.

It must, however, be understood that Sailing Directions will rarely be correct in all details, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide, for which purpose, for ordinary navigation, it is sufficient.

The Tide Tables, which are published annually by the United States Coast and Geodetic Survey, give the predicted times and heights of the high and the low waters for every day in the year at 70 of the principal ports of the world, and, through the medium of these by means of tidal differences and ratios, at a very large number of subordinate ports. The tables for the Atlantic and the Pacific coast ports of the United States are also published separately.

It should be remembered that these tables aim to give the times of high and low water, and not the times of turning of the current or of slack water, which may be quite different.

Notices to Mariners, containing fresh information pertaining to all parts of the world, are published weekly and mailed to all

United States ships in commission, Branch Hydrographic offices and agencies, and United States consulates. Copies are furnished free by the main office or by any of the branch offices on application.

With each Notice to naval vessels is sent also a separate sheet, giving the items relating to lights contained in the latest Notice, intended especially for use in correcting the Light Lists.

Pilot Charts of the North Atlantic, Central American Waters, and North Pacific and Indian Oceans are published each month, and of the South Atlantic and South Pacific Oceans each quarter. These charts give the average conditions of wind and weather, barometer, percentage of fog and gales, routes for steam and sailing vessels for the period of issue, ice and derelicts for the preceding period, ocean currents and magnetic variation for the current year, storm tracks for preceding years, and much other useful information. They are furnished free only in exchange for marine data or observations.

Hydrographic Bulletins, published weekly, are supplemental to the Pilot Charts, and contain the latest reports of obstructions and dangers along the coast and principal ocean routes, ice, derelicts, and wreckage, reports of the use of oil to calm the sea, and other information for mariners. They are to be had free upon application.

THE USE OF CHARTS.

Accuracy of chart.—The value of a chart must manifestly depend upon the character and accuracy of the survey on which it is based, and the larger the scale of the chart the more important do these become.

To judge of a survey, its source and date, which are generally given in the title, are a good guide. Besides the changes that may have taken place since the date of the survey, in waters where sand or mud prevails, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail; until a chart founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbors and their approaches, no surveys yet made have been so thorough as to make it certain that all dangers have been found. The number of the soundings is another method of estimating the completeness of the survey, remembering, however, that the chart is not expected to show all the soundings that were obtained. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Large or irregular blank spaces among soundings mean that no soundings were obtained in these spots. When the surrounding soundings are deep it may fairly be assumed that in the blanks the water is also deep; but when they are shallow, or it can be

seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch or pinnacle rock.

A wide berth should therefore be given to every rocky shore or patch, and instead of considering a coast to be clear, the contrary should be assumed.

Fathom curves a caution.—Except in charts of harbors that have been surveyed in detail, the 5-fathom curve on most charts may be considered as a danger line or caution against unnecessarily approaching the shore or bank within that line, on account of the possible existence of undiscovered inequalities of the bottom, which only an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for so detailed a survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The 10-fathom curve on rocky shores is another warning, especially for ships of heavy draft.

A useful danger curve will be obtained by tracing out with a colored pencil, or ink, the line of depth next greater than the draft of the ship using the chart. For vessels drawing less than 18 feet the edge of the sanding serves as a well-marked danger line.

Charts on which no fathom curves are marked must especially be regarded with caution, as indicating that soundings were too scanty and the bottom too uneven to enable the curves to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed around, as it is doubtful how closely the spot may have been examined and whether the least depth has been found.

The chart on largest scale should always be used on account of its greater detail and the greater accuracy with which positions may be plotted on it.

Caution in using small-scale charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large-scale chart, whereas on one of small scale the same amount of displacement means a large fraction of a mile.

Distortion of printed charts.—The paper on which charts are printed from engraved plates has to be damped. On drying distortion takes place from the inequalities of the paper, which greatly

varies with different papers and the amount of the damping; but it does not affect navigation. The larger the chart the greater the amount of this distortion. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree when carefully plotted on the chart, especially if the lines to objects be long.

Mercator chart.—Observed bearings are not identical with those measured on the Mercator chart (excepting only the bearings north and south, and east and west on the equator) because the line of sight, except as affected by refraction, is a straight line and lies in the plane of the great circle, while the straight line on the chart (except the meridian line) represents, not the arc of a great circle, but the loxodromic curve, or rhumb line, which on the globe is a spiral approaching but never in theory reaching the pole, or, if the direction be east and west, a circle of latitude.

The difference is not appreciable with near objects, and in ordinary navigation may be neglected. But in high latitudes, when the objects are very distant and especially when lying near east or west, the bearings must be corrected for the convergence of the meridians in order to be accurately placed on the Mercator chart, which represents the meridians as parallel.

On the polyconic chart, since a straight line represents (within the limits of 15 or 20 degrees of longitude) the arc of a great circle or the shortest distance between two points, bearings of the chart are identical with observed bearings.

The mercator projection is unsuited to surveying, for which purpose the polyconic projection is used by the Hydrographic Office and the Coast and Geodetic Survey.

Notes on charts should always be read with care, as they may give important information that can not be graphically represented.

Buoys.—Too much reliance should not be placed on buoys always maintaining their exact positions. They should therefore be regarded as warnings, and not as infallible navigational marks, especially when in exposed places and in the wintertime; and a ship's position should always, when possible, be checked by bearings or angles of fixed objects on shore.

Gas buoys.—The lights shown by gas buoys can not be implicitly relied on; the light may be altogether extinguished, or, if periodic, the apparatus may get out of order.

Whistle and bell buoys are sounded only by the action of the sea; therefore, in calm weather, they are less effective or may not sound.

Lights.—All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of 15 feet for the observer's eye. The effect of a greater or less height

of eye can be ascertained by means of the table of distances of visibility due to height, published in the Light Lists.

The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Refraction, too, may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light, the fact may be forgotten that aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be obtained from the standard compass when you lay down from aloft.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the ship is on the circle of visibility corresponding with the usual height of the eye, or unexpectedly nearer the light.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by its candlepower or order, as stated in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range corresponding to its height. Thus, a light standing 200 feet above the sea and recorded as visible only 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles if of sufficient power.

Fog signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from the influence of the wind large areas of silence have been found in different directions and at different distances from the origin of sound, even in clear weather; therefore, too much confidence should not be felt as to hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly toward the land, and may not be observed by the lighthouse keepers until upon them; a ship may have been for many hours in it, and approaching the land in confidence, depending on the signal, which is not sounded. When sound travels against the wind, it may be thrown upward; a man aloft might then hear it though inaudible on deck.

The submarine bell system of fog signals is much more reliable than systems transmitting sound through the air, as sound traveling in water is not subject to the same disturbing influences; the fallibility of the lighthouse keeper is, however, about the same in all systems, so that caution should be observed even by vessels equipped with submarine-bell receiving apparatus.

Submarine bells have an effective range of audibility greater than signals sounded in air, and a vessel equipped with receiving apparatus may determine the approximate bearing of the signal. These signals may be heard also on vessels not equipped with receiving apparatus by observers below the water line, but the bearing of the signal can not then be readily determined.

Vessels equipped with radio apparatus and submarine bell receivers may fix their distance from a light vessel having radio and submarine bell, utilizing the difference in velocity of sound waves of the radio and the bell. Sound travels 4,794 feet per second at 66° F. in water, and the travel of radio sound waves for practicable distances may be taken as instantaneous.

All vessels should observe the utmost caution in closing the land in fogs. The lead is the safest guide and should be faithfully used.

Tides.—A knowledge of the times of high and low water and of the amount of vertical rise and fall of the tide is of great importance in the case of vessels entering or leaving port, especially when the low water is less than or near their draft. Such knowledge is also useful at times to vessels running close along a coast, in enabling them to anticipate the effect of the tidal currents in setting them on or offshore. This is especially important in fog or thick weather.

The predicted times and heights of the high and low waters, or differences by which they may be readily obtained, are given in the Tide Tables for all the important ports of the world. The height at any intermediate time may be obtained by means of Tables 2A and 2B for most of the principal tidal stations of the United States, given in Table 1, and for the subordinate stations of Table 3 by using them as directed in the Tide Tables. The intermediate height may also be obtained by plotting the predicted times and heights of high and low water and connecting the points by a curve. Such knowledge is often useful in crossing a bar or shallow flats.

Planes of reference.¹—The plane of reference for soundings on Hydrographic Office charts made from United States Government surveys and on Coast and Geodetic Survey charts of the Atlantic coast of the United States is mean low water; on the Pacific coast of the United States as far as the Strait of Juan Fuca, it is the mean of the lower low waters; and from Puget Sound to Alaska, the plane employed on Hydrographic Office charts is low water ordinary springs.

On most of the British Admiralty charts the plane of reference is the low water of ordinary springs; on French charts, the low water of equinoctial springs.

¹ The distinction between "rise" and "range" of the tide should be understood. The former expression refers to the height attained above the datum plane for soundings, differing with the different planes of reference; the latter, to the difference of level between successive high and low waters.

In the case of many charts compiled from old or various sources the plane of reference may be in doubt. In such cases, or when ever not stated on the chart, the assumption that the reference plane is low water ordinary springs gives a larger margin of safety than mean low water.

Whichever plane of reference may be used for a chart it must be remembered that there are times when the tide falls below it. Low water is lower than mean low water about half the time, and when a new or full moon occurs at perigee the low water is lower than the average low water of springs. At the equinoxes the spring range is also increased on the coasts of Europe, but in some other parts of the world, and especially in the Tropics, such periodic low tides may coincide more frequently with the solstices.

Wind or a high barometer may at times cause the water to fall below even a very low plane of reference.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can not be depended upon and additional caution is necessary.

Mean sea level.—The important fact should be remembered that the depths at half tide are practically the same for all tides, whether neaps or springs. Half tide therefore corresponds with mean sea level. This makes a very exact plane of reference, easily found, to which it would be well to refer all high and low waters.

The Tide Tables give in Table 3, for all the ports, the plane of reference to which tidal heights are referred and its distance below mean sea level.

If called on to take special soundings for the chart at a place where there is no tidal bench mark, mean sea level should be found and the plane for reductions established at the proper distance below it, as ascertained by the Tide Tables, or by observations, or in some cases, if the time be short, by estimation, the data used being made a part of the record.

Tidal streams.—In navigating coasts where the tidal range is considerable, especial caution is necessary. It should be remembered that there are indrafts to all bays and bights, although the general run of the stream may be parallel with the shore.

The turn of the tidal stream offshore is seldom coincident with the times of high and low water on the shore. In some channels the tidal stream may overrun the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity

The effect of the tidal wave in causing currents may be illustrated by two simple cases.

(1) Where there is a small tidal basin connected with the sea by a large opening.

(2) Where there is a large tidal basin connected with the sea by a small opening.

In the first case the velocity of the current in the opening will have its maximum value when the height of the tide within is changing most rapidly, i. e., at a time about midway between high and low water. The water in the basin keeps at approximately the same level as the water outside. The flood stream corresponds with the rising and the ebb with the falling of the tide.

In the second case the velocity of the current in the opening will have its maximum value when it is high water or low water without, for then there is the greatest head of water for producing motion. The flood stream begins about three hours after low water, and the ebb stream about three hours after high water, slack water thus occurring about midway between the tides.

Along most shores not much affected by bays, tidal rivers, etc., the current usually turns soon after high water and low water.

The swiftest current in straight portions of tidal rivers is usually in the middle of the stream, but in curved portions the most rapid current is toward the outer edge of the curve, and here the water will be deepest. The pilot rule for best water is to follow the ebb tide reaches.

Countercurrents and eddies may occur near the shores of straits, especially in bights and near points. A knowledge of them is useful in order that they may be taken advantage of or avoided.

A swift current often occurs in a narrow passage connecting two large bodies of water, owing to their considerable difference of level at the same instant. The several passages between Vineyard Sound and Buzzards Bay are cases in point. In the Woods Hole passage the maximum strength of the tidal streams is at about half tide.

Tide rips are made by a rapid current setting over an irregular bottom, as at the edges of banks where the change of depth is considerable.

Current arrows on charts show only the most usual or the mean direction of a tidal stream or current; it must not be assumed that the direction of a stream will not vary from that indicated by the arrow. The rate, also, of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

FIXING POSITION.

Sextant method.—The most accurate method available to the navigator of fixing a position relative to the shore is by plotting with a protractor, sextant angles between three well-defined objects on

shore which are shown on the chart; this method, based on the "three-point problem" of geometry, should be in general use.

For its successful employment it is necessary: First, that the objects be well chosen; and, second, that the observer be skillful and rapid in his use of the sextant. The latter is only a matter of practice. Two observers are better for this method.

Near objects should be used either for bearings or angles for position in preference to distant ones, although the latter may be more prominent, as a small error in the bearing or angle or in laying it on the chart has a greater effect in misplacing the position the longer the line to be drawn.

On the other hand distant objects should be used for direction, because less affected by a small error or change of position.

The three-arm protractor or station pointer consists of a graduated brass circle with one fixed and two movable radial arms, the three beveled edges of the arms, if produced, intersecting at the exact center of the instrument. The edge of the fixed arm marks the zero of the graduation which enables the movable arms to be set at any angles with the fixed arm.

To plot a position, the two angles observed between the three selected objects are set on the instrument, which is then moved over the chart until the three beveled edges pass respectively and simultaneously through the three objects. The center of the instrument will then mark the ship's position, which may be pricked on the chart or marked with a pencil point through the center hole.

The transparent xylonite protractor is an excellent substitute for the brass instrument and in some cases preferable to it, as when, for instance, the objects angled on are so near the observer that they are more or less hidden by the circle of the instrument. The xylonite protractor also permits the laying down for simultaneous trial of a number of angles in cases of fixing important positions. Plain tracing paper may also be used if there are any suitable means of laying off the angles.

The value of a determination depends greatly on the relative positions of the objects observed. If the position sought lies on the circle passing through three objects (in which case the sum of the observed angles equals the supplement of the angle at the middle object made by lines from the other two) it will be indeterminate, as it will plot all around the circle. Such an observation is called a "revolver." An approach to this condition must be avoided. Near objects are better than distant ones, and, in general, up to 90° the larger the angles the better, remembering always that large as well as small angles may plot on or near the circle and hence be worthless. If the objects are well situated, even very small angles will give for

navigating purposes a fair position, when that obtained by bearings of the same objects would be of little value.

Accuracy requires that the two angles be simultaneous. If under way and there is but one observer the angle that changes less rapidly may be observed both before and after the other angle and the proper value obtained by interpolation.

A single angle and a range of two objects give in general an excellent fix, easily obtained and plotted.

Advantages of sextant method.—In many narrow waters where the objects may yet be at some distance, as in coral harbors or narrow passages among mud banks, navigation by sextant and protractor is invaluable, as a true position can in general be obtained only by its means. Positions by bearings are too rough to depend upon, and a small error in either taking or plotting a bearing might under such circumstances put the ship ashore.

In all cases where great accuracy of position is desired, such as the fixing of a rock or shoal, or of fresh soundings or new buildings as additions to the chart, the sextant should invariably be used. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. If a round of angles can be taken the observer's accuracy is also checked. In the case of ordinary soundings a third angle need be taken only occasionally; first, to check the general accuracy of the chart, as above stated; second, to make certain that the more important soundings, as at the end of a line, are correctly placed.

If communication can be had with the shore, positions may be fixed with great accuracy by occupying with theodolite or sextant two known points of the chart. The third angle of the triangle, that between the two points at the position sought, should be measured as a check.

The compass.—It is not intended that the use of the compass to fix the ship should be given up; in ordinary piloting the compass, with its companion, the pelorus, may be usefully employed for this purpose, although less accurate than the sextant.

If the accuracy of the chart is doubtful, the compass should be used in preference to the sextant.

In fixing by the compass, it should always be remembered that a position by two bearings only, like that by two angles only, is liable to error. An error may be made in taking a bearing, or in applying to it the deviation, or in laying it on the chart. A third or check bearing should, therefore, be taken of some other object, especially when near the shore or dangers. A common intersection for the three lines assures accuracy.

When the three lines do not intersect in a point, the following rule holds: If the line drawn to the middle object falls to the right of the point of intersection of the lines to the two outside objects, the position of the observer was to the right of the line to the middle object; and if it falls to the left of the intersection his position was to the left of the line. Thus it will be seen that the assumption, that the position is at the center of the triangle formed by the intersecting lines, is incorrect.

Doubling the angle on the bow.—The method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "bow and beam bearing," the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives the maximum of accuracy, and is an excellent fix for a departure, but does not insure safety, as the object observed and any dangers off it are abeam before the position is obtained.

By taking the bearings at two points and four points on the bow, a fair position is obtained before the object is passed, the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current. Taking afterwards the beam bearing gives, with slight additional trouble, the distance of the object when abeam; such beam bearings and distances, with the times, should be continuously recorded as fresh departures, the importance of which will be appreciated in cases of being suddenly shut in by fog.

When the first bearing is $26\frac{1}{2}^{\circ}$ from ahead, and the second 45° , the run between bearings will equal the distance at which the object will be passed abeam.

A table of multipliers of the distance run in the interval between any two bearings of an object, the product being its distance at the time of the second bearing, is given in the Light Lists and in Bowditch.

Danger angle.—The utility of the danger angle in passing outlying rocks or dangers should not be forgotten. In employing the horizontal danger angle, however, caution is necessary, as should the chart be inaccurate, i. e., should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

The vertical danger angle may be conveniently used when passing elevated points of known heights, such as lighthouses, cliffs, etc. The computation of the distance corresponding to the height of the object and its angular elevation requires for small distances merely the solution of a plain right triangle; the natural cotangent of the angle multiplied by the height in feet gives the distance in

feet. The convenient use of this method, however, requires tables such as those published by Capt. Lecky in his little book entitled "The Danger Angle and Offshore Distance Tables." This book very usefully extends the vertical angle method to finding a ship's position at sea by observing the angular altitude of a peak of known height and its bearing. The tables give heights up to 18,000 feet and distances up to 110 miles.

When the angles are not too large they should be observed "on and off the limb" and the index error of the sextant thus eliminated, in preference to correcting for it the single altitude. It must be remembered that in high latitudes the bearing of a distant object needs correction for the convergence of the meridians before being laid down on a Mercator chart. The correction may be found by the following formula, using the approximate position: The sine of the correction equals the product of the sine of half the difference of longitude by the sine of the middle latitude. It is applied on the equatorial side of the observed bearing and its effect is always to increase the latitude of the observer.

Soundings taken at random are of little value in fixing or checking position and may at times be misleading. In thick weather, when near or closing the land, soundings should be taken continuously and at regular intervals, and, with the character of the bottom, systematically recorded. By laying the soundings on tracing paper, according to the scale of the chart, along a line representing the track of the ship, and then moving the paper over the chart, keeping the line representing the track parallel with the course until the observed soundings agree with those of the chart, the ship's position will in general be quite well determined. This plan was suggested by Lord Kelvin, whose admirable sounding machine renders the operation of sounding possible in quite deep water, without slowing down the ship and consequent loss of time.

Pelorus.—All ships should be supplied with the means of taking accurate bearings both by night and by day. The standard compass is not always conveniently placed for the purpose; in such case a pelorus will be very useful, but the results are not as accurate as those obtained direct from the compass. The utility of such an instrument in ascertaining the change of bearing of an approaching ship should not be overlooked.

Position lines.—Among the various methods of fixing position at sea, the one which should be best understood and put to the most constant use is that employing position or Sumner lines. These lines give the most comprehensive information to the navigator with the least expenditure of labor and time. The knowledge gained is that the vessel must be somewhere on the line, provided the data used is accurate and the chronometer correct. As the information

given by one line of position is not sufficient to determine the definite location of the vessel, it is necessary to cross this line by another similarly obtained, and the vessel being somewhere on both must be at their intersection. However, a single line, at times, will furnish the mariner with invaluable information; for instance, if it is directed toward the coast, it marks the bearing of a definite point on the shore, or if parallel to the coast it clearly indicates the distance off, and so will often be found useful as a course. A sounding taken at the same time with the observation will in certain conditions prove of great value in giving an approximate position on the line.

The easiest and quickest way to establish a line of position is by employing the method of Marcq St. Hilaire, as modified by the use of tables of altitude. The principle of this method is one of altitude differences, in which the observed altitude is compared with the computed altitude for a dead reckoning, or other selected position, and the difference in minutes of latitude measured toward the body along the line of its azimuth, if the observed altitude is greater than the computed altitude, and vice versa. A line drawn at right angles to the line of azimuth through the point thus determined is the position line, somewhere upon which will be found the position of the vessel. The tables of altitude obviate the computation of the altitude and thereby greatly facilitate the establishment of the line.

A position line may also be found by computing two positions for longitude with two assumed latitudes, and drawing the line between them; or by drawing to the position obtained with one latitude a line at right angles to the bearing of the body as taken from the azimuth tables.

A very accurate position can be obtained by observing two or more stars at morning or evening twilight, at which time the horizon is well defined. The position lines thus obtained will, if the bearings of the stars differ three points or more, give an excellent result. A star or planet at twilight and the sun afterwards or before may be combined; also two observations of the sun with sufficient interval to admit of a considerable change of bearing. In these cases one of the lines must be moved for the run of the ship. The moon is often visible during the day and in combination with the sun gives an excellent fix.

The morning and evening twilight observations, besides their great accuracy, possess the additional advantage of greatly extending the ship's reliable reckoning beyond the limits of the ordinary day navigation, and correspondingly restricting the dead reckoning uncertainties of the night. An early morning fix in particular is often of great value. Though the same degree of

accuracy as at twilight can not be expected, night observations are very valuable and should be assiduously practiced.

Piloting.—The navigator, in making his plan for entering a strange port, should give very careful previous study to the chart and sailing directions, and should select what appear to be the most suitable marks for use, also providing himself with substitutes to use in case those selected as most suitable should prove unreliable in not being recognized with absolute certainty. Channel buoys seen from a distance are difficult to identify, because their color is sometimes not easily distinguished and they may appear equally distant from the observer even though they be at widely varying distances. Ranges should be noted, if possible, and the lines drawn, both for leading through the best water in channels, and also for guarding against particular dangers; for the latter purpose safety bearings should in all cases be laid down where no suitable ranges appear to offer. The courses to be steered in entering should also be laid down and distances marked thereon. If intending to use the sextant and danger angle in passing dangers, and especially in passing between dangers, the danger circles should be plotted and regular courses planned, rather than to run haphazard by the indications of the angle alone, with the possible trouble from bad steering at critical points.

The ship's position should not be allowed to be in doubt at any time, even in entering ports considered safe and easy of access, and should be constantly checked, continuing to use for this purpose those marks concerning which there can be no doubt until others are unmistakably identified.

The ship should ordinarily steer exact courses and follow an exact line, as planned from the chart, changing course at precise points, and, where the distances are considerable, her position on the line should be checked at frequent intervals. This is desirable even where it may seem unnecessary for safety, because if running by the eye alone and the ship's exact position be immediately required, as in a sudden fog or squall, fixing at that particular moment may be attended with difficulty.

The habit of running exact courses with precise changes of course will be found most useful when it is desired to enter port or pass through inclosed waters during fog by means of the buoys; here safety demands that the buoys be made successively, to do which requires, if the fog be dense, very accurate courses and careful attention to the times, the speed of the ship, and the set of the current; failure to make a buoy as expected leaves, as a rule, no safe alternative but to anchor at once, with perhaps a consequent serious loss of time.

In passing between dangers where there are no suitable leading marks, as, for instance, between two islands or an island and the main shore, with dangers extending from both, a mid-channel course may be steered by the eye alone with great accuracy, as the eye is able to estimate very closely the direction midway between visible objects.

In piloting among coral reefs or banks, a time should be chosen when the sun will be astern, conning the vessel from aloft or from an elevated position forward. The line of demarcation between the deep water and the edges of the shoals, which generally show as green patches, is indicated with surprising clearness. This method is of frequent application in the numerous passages of the Florida Keys.

Changes of course should in general be made by exact amounts, naming the new course or the amount of the change desired, rather than by ordering the helm to be put over and then steadying when on the desired heading, with the possibility of the attention being diverted and so of forgetting in the meantime, as may happen, that the ship is still swinging. The helmsman, knowing just what is desired and the amount of the change to be made, is thus enabled to act more intelligently and to avoid bad steering, which in narrow channels is a very positive source of danger.

Coast piloting involves the same principles and requires that the ship's position be continuously determined or checked as the landmarks are passed. On well-surveyed coasts there is a great advantage in keeping near the land, thus holding on to the marks and the soundings, and thereby knowing at all times the position, rather than keeping offshore and losing the marks, with the necessity of again making the land from vague positions, and perhaps the added inconvenience of fog or bad weather, involving a serious loss of time and fuel.

The route should be planned for normal conditions of weather, with suitable variations where necessary in case of fog or bad weather or making points at night, the courses and distances, in case of regular runs over the same route, being entered in a notebook for ready reference, as well as laid down on the chart. The danger circles for either the horizontal or the vertical danger angles should be plotted, wherever the method can be usefully employed, and the angles marked thereon; many a mile may thus be saved in rounding dangerous points with no sacrifice in safety. Ranges should also be marked in, where useful for position or for safety, and also to use in checking the deviation of the compass by comparing, in crossing, the compass bearing of the range with its magnetic bearing, as given by the chart.

Changes of course will in general be made with mark or object abeam, the position (a new "departure") being then, as a rule, best and most easily obtained. The pelorus should be at all times in readiness for use, and the chart where it may be readily consulted by the officer of the watch. The sextant should also be kept conveniently at hand.

A continuous record of the progress of the ship should be kept by the officer of the watch, the time and patent-log reading of all changes of course and of all bearings, especially the two and four point bearings, with distance of object when abeam, being noted in a book kept in the pilot house for this especial purpose. The ship's reckoning is thus continuously cared for as a matter of routine and without the presence or particular order of the captain or navigating officer. The value of thus keeping the reckoning always fresh and exact will be especially appreciated in cases of sudden fog or when making points at night.

Where the coastwise trip must be made against a strong head wind, it is desirable, with trustworthy charts, to skirt the shore as closely as possible in order to avoid the heavier seas and adverse current that prevail farther out. In some cases, with small ships, a passage can be made only in this way. The important saving of coal and of time, which is even more precious, thus effected by skillful coast piloting makes this subject one of prime importance to the navigator.

Change in the variation of the compass.¹—The gradual change in the variation must not be forgotten in laying down on the chart courses and bearings. The magnetic compasses placed on the charts for the purpose of facilitating the plotting become in time slightly in error, and in some cases, such as with small scales or when the lines are long, the displacement of position from neglect of this change may be of importance. The date of the variation and the annual change, as given on the compass rose, facilitate corrections when the change has been considerable. The compasses are reengraved once in ten years; more frequent alterations on one spot in a copperplate would not be practicable.

The change in the variation is in some parts of the world so rapid as to need careful consideration, requiring a frequent change of the course. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles.

Local magnetic disturbance of the compass on board ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the

¹ See H. O. Chart No. 2436, Variation of the Compass.

ship. Observation shows that disturbance of the compass in a ship afloat is experienced in only a few places on the globe.

Magnetic laws do not permit of the supposition that the visible land causes such disturbance, because the effect of a magnetic force diminishes so rapidly with distance that it would require a local center of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot; but the area of disturbance will be small unless there are many centers near together.

Use of oil for modifying the effect of breaking waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skillfully applied, may prevent much damage both to ships, especially of the smaller classes, and to boats by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:

1. On free waves, i. e., waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.

3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when no other oil is obtainable, or it may be mixed with other oils; all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. In cold water, the oil, being thickened by the low temperature and not being able to spread freely, will have its effect much reduced, a rapid-spreading oil should be used.

5. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

6. It is useful in a ship or boat either when running, or lying-to, or in wearing.

7. When lowering and hoisting boats in a heavy sea the use of oil has been found greatly to facilitate the operation.

8. For a ship at sea the best method of application appears to be to hang over the side, in such a manner as to be in the water, small canvas bags, capable of holding from 1 to 2 gallons of oil, the bags being pricked with a sail needle to permit leakage. The waste pipes forward are also very useful for this purpose.

9. Crossing a bar with a flood tide, to pour oil overboard and allow it to float in ahead of the boat, which would follow with a bag towing astern, would appear to be the best plan.

On a bar, with the ebb tide running, it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside, bearing in mind that her natural tendency is always to forge ahead. If she is aground the effect of oil will depend upon attending circumstances.

11. For a boat riding in bad weather to a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil can be diffused well ahead of the boat, and the bag readily hauled on board for refilling, if necessary.



PACIFIC ISLANDS PILOT.

VOLUME I.

CHAPTER I.

GENERAL REMARKS—WINDS—CURRENTS—COMMUNICATIONS— VIGIAS—ROUTES—AND REMARKS ON THE NATIVES

Plan.—The sailing directions for the Pacific Islands are comprised in two volumes published by the Hydrographic Office. The groups and islands are treated in Hydrographic Office Publication No. 165, *Pacific Islands Pilot*, Volume I, in the following order: New Caledonia, Loyalty, New Hebrides, Santa Cruz, Solomon, Neu Mecklenburg, Neu Pommern, Admiralty, Marshall, Caroline, and Palao Islands, and the Marianas.

Hydrographic Office Publication No. 166, *Pacific Islands Pilot*, Volume II, now in preparation, will comprise: The Gilbert, Ellice, Union, Phoenix, Fiji, Samoa, Tonga, Cook, Society, the Tuamotu Archipelago, and the Marquesas Islands.

New Caledonia (a French possession) is the third island in point of size in the South Pacific, being inferior in this respect only to New Zealand and New Guinea. It is 290 miles long, and about 43 miles broad across the reefs at the south end, diminishing to 30 at the north end.

Conditions of Admission and Sojourn of French and Foreign Ships in the Anchorages and Ports of the French Littoral in Time of War.

1. In time of war no French merchant ship and no foreign ship, either man-of-war or merchant ship, may approach the French coast within a less distance than 3 miles, between sunrise and sunset, without permission. Between sunset and sunrise it is absolutely prohibited to approach within that distance.

During the day any vessel near enough to the land to distinguish the color of flags must hoist her ensign. If it is desired to enter the prohibited zone a signal must be hoisted for a pilot, and the vessel must be kept outside the 3-mile limit until she has been communicated with or permission has been received by signal.

All vessels are to immediately comply with instructions from men-of-war or signal stations, either when hailed or by signals made by the International Code.

2. In time of war, if a vessel such as is referred to in this order does not conform to the above orders, one of the neighboring batteries or ship of war stationed in the vicinity will fire a blank charge to enforce the order. Should no notice be taken of this, after two minutes, a shell will be fired across the bows, and if after another interval of two minutes the vessel is not stopped or hauled off, fire will be opened on her. In urgent cases the preliminary blank charge will be dispensed with. At night, at less than a mile, the preliminary shell may also be dispensed with.

Any vessel transgressing the order relative to the prohibition of forbidden zones is rendered liable to be destroyed, and if approaching at night at less than a mile from the coast, to be fired on without any previous notice.

3. In time of war in roadsteads and military ports all boat traffic, except that belonging to French ships of war, is prohibited between sunset and sunrise. This boat work is not permitted between sunrise and sunset except for those boats to which the maritime authorities have granted a special permit, at the time, as a means of recognition. These authorized boats must get out of the way of ships of war if they are instructed to do so, and in no case go alongside without having received permission. The movements of these boats will be, moreover, subject to local orders, especially with respect to the prohibition to enter certain parts of the roadstead, or to go alongside in any other place than those expressly laid down. In commercial ports special measures will be taken by the principal authority, in such a manner as to protect the interests of commerce, in enforcing the necessary restrictions on the movements of boats.

4. In time of war vessels authorized to enter French ports and roadsteads must anchor where they may be instructed to do so by the local authorities, and conform strictly with all regulations of whatever nature ordered by the authorities. The duration of their stay will be subject to the requirements of the military orders, and when circumstances demand it the principal authority will instruct them to leave or to move into any position decided on. This order must be executed without delay, a demurrer being, however, able to be given to ships which find that it is quite impossible to conform with it immediately.

No ship can get under way, either to change her anchorage or to leave the roadstead, without having received permission from the local authorities.

5. The foregoing measures in this order will be applicable from the time of mobilization.

6. Orders contrary to this decree are annulled.

The French flag was hoisted in New Caledonia in 1853, and 10 years later it was made a French penal settlement.

New Caledonia was first discovered on September 4, 1774.

Natives.—In 1853, the date of the occupation by the French, New Caledonia and the Loyalty Group were inhabited by two entirely different races. One of these, the Melanesian race, without being absolutely black as negroes, had similar characteristics of feature. In 1876, when the first census was taken, they numbered from 40,000 to 50,000, which sank to 33,000 in 1892; in 1906 they numbered 52,760.

Aspect and formation.—New Caledonia is generally mountainous and apparently of ancient formation; it has undergone violent convulsions, of which traces are to be found at every step. Though many of the mountain masses appear to be due to volcanic upheavals, no crater, extinct or otherwise, has yet been found (1891). Before the island had been crossed from one side to the other, it was supposed that one or more chains of mountains ran parallel with the coast, but as the result of many journeys it has been found that at the south end of the island—that is, southeast of a line drawn from Mount d'Or to Unia—the coast is bordered with high uneven mountains, diminishing gradually in height while extending to the southward.

The chain on the west coast terminates at the entrance of South Bay; that on the east side terminates between Kuebuni and Port Boise. The mountains forming the first chain fall into the sea with steep slopes or abrupt sides, forming only one valley of importance, that of the River Kaoris, which terminates at the Bay of Kuo or Pirogues. It is not so on the east coast, where there is a strip of lowland about $1\frac{1}{4}$ to $\frac{1}{2}$ mile wide between the toe of the mountains and the sea. That narrow strip extends from Kuebuni to the west side of Port Unia, the inner part being highly suitable for cultivation, though often inundated during the rainy season; but as the sea is approached the thickness of earth and decayed vegetable matter washed from the slopes of the mountains, decreases, and the shore presents a bed of coral rock covered by an impenetrable thicket of pandanus or screw pine.

The most uneven and broken part of New Caledonia is found within the lines from Unia to Mount d'Or and from the valley of Tchio to Uarai Bay. Throughout the whole of that space the mountain masses appear to have been thrown in the greatest disorder; they are quite disunited and are generally composed of two or three very high peaks projecting from enormous buttresses in all directions with a slope of 30° to 35° , and many are quite inaccessible, inclosing in some places small rivulets and in others mountain torrents of considerable size. The principal amidst that chaos is

Mount Humbolt, situated 11 miles southward of Tupeti Island and elevated 5,380 feet above the sea. To the southeast and to the westward of Humbolt there are a number of peaks ranging from 4,900 to 5,250 feet in height; and at less than 980 feet below its summit is the source of the River Tontuta, which falls into the sea at the eastern part of St. Vincent Bay. The origin of the stream is questionable, especially with regard to its singular situation; the torrent is by far too abundant during the dry season to be attributed solely to the running of rain water. The Tontuta, by the aid of affluents, at about 2 leagues from the sea, forms a considerable body of water, and while following a gradual descent traverses the magnificent Plain of St. Vincent.

The seashore on the west side of the island, from Mount d'Or to beyond Uarai, is less uneven than it is on the east side; the spurs from the mountains seldom come down to the sea, but are replaced by hills which are easy of access. There are extensive fertile plains in this part of the island, and here the Europeans principally reside.

In the plains near the seashores of Yate and Unia, where there is less alluvial deposit than on the west coast, the soil is pierced by rock in many places, and far from the sea the heads of coral appear frequently in the midst of kitchen gardens, in which taro is successfully cultivated by the natives.

The whole of the east coast is bordered, except around some of the bays, by bare-sided steep cliffs, often much undermined. The ferruginous soil continues near the seashore as far as Tchio Valley, though of a shade less red than it is farther south. In the interior the red earth is replaced by trachyte and diorite, of which the mountains are almost exclusively composed. Thus the vegetation is stunted or many places are quite bare.

The preceding description will suffice to show that the general aspect of New Caledonia is at first view gloomy and uninviting, notwithstanding it has in its great length, scattered in the valleys and on some portions of the seashore, a considerable surface of land suitable for the establishment of European agriculture. The north part of the island differs from the south in respect to soil; the ferruginous earth disappears; quartz and silex replace the trap rock which dominates in the south; the mountains are less abrupt and less torn or rent. At the little port Yenghen, on the east coast, basaltic rocks of fantastic forms and cliffs pierced by magnificent grottoes break the monotonous appearance.

At the northern part of the island there are only two distinct chains of mountains separated by the Diahot de Bonde Valley. The most important river on the island flows through that valley and discharges into the sea opposite Balabio Island. On the banks of that river gold and copper have been discovered.

Of those two chains of mountains, that to the northeast follows the coast line and only presents valleys insignificant in size; Balabio Island appears to be a prolongation of that range. The chain on the southwest side is narrower and forms the northern boundary of some extensive plains, of which Gomen and Nehue are the most beautiful. That latter mountain chain is prolonged 12 or 15 miles farther than that on the right-hand side of the river, as far as Paaba Island; they both terminate with hills which diminish in height gradually and regularly. The Belep group of islands and islets may be considered as a prolongation of New Caledonia to the northwest.

Products and industries.—The forests of New Caledonia are rich in timber of various kinds; there is some handsome wood suitable for making fancy furniture. The art of cutting timber is unknown on the island; therefore it is purchased from America and New Zealand for use in mines and for building purposes. The agricultural produce of New Caledonia is insignificant, being confined chiefly to coffee and maize; the former commands a good price in Sydney, but the maize is considered inferior and it is liable to be destroyed by locusts. Tobacco is not extensively cultivated and is of inferior quality; the soil is said to be too poor. Maize, coffee, lucern, and hay give a good supply; rice and beans are produced, but not sufficient to avoid imports.

Some fruits and vegetables have been plentiful in Noumea market. Potatoes are chiefly imported from Australia and Norfolk Island, and all breadstuffs are imported. Tapioca of good quality is now manufactured out of manioc at the convict settlement at Burai. A small quantity of rum has been distilled from sugar, but it did not pay expenses. Some leather and various barks suitable for tanning are produced on the island.

Mines.—Beyond a doubt New Caledonia is rich in minerals—nickel, copper, antimony, and chrome abound, also some gold. The Balade copper mine is now working. The two large mining companies, the Nickel and the Mines du Nord, have extensive smelting works at Tchio and Pam, from whence considerable shipments of copper, nickel, silver, lead, and cobalt have been sent away; also rough ore—nickel, chrome, and cobalt—is exported in large quantities by French and English vessels.

Communication.—A submarine telegraph cable connects Harvey Bay, Queensland, with Gomen Bay, New Caledonia, so that New Caledonia is in telegraphic communication with the rest of the world. The telegraph is also extensively used on the island. A steamer under the French flag runs monthly from Noumea to the Loyalty Islands and New Hebrides. The mails are carried by the

Messageries Maritimes vessels, and by an Australian company when a freight from Sydney is procurable. There are two regular steamers a month, both to the east and west coasts. The French mail steamers are independent of freight and arrive very irregularly.

Climate.—The climate of New Caledonia is salubrious. The laborious work executed has not hitherto occasioned sickness, and the rate of mortality has been less than in France. The temperature, due to the fresh breeze which prevails nearly throughout the year, never attains a very high point. During January, February, and March it seldom reaches 86° F., nor does it descend below 59° during the nights of July and August; it is not exposed to sudden changes as at Tahiti.

The year in New Caledonia is divided into two distinct seasons—the wet (also called winter) and dry seasons. The first lasts from the end of December to the end of April; there is much rain during those four months, especially when the wind shifts from east-northeast through north to west-southwest. The winds at that season are irregular and often very strong.

Tides in New Caledonia.—The time of high water has been carefully ascertained on both coasts, and it is found to be nearly the same in Prony Bay as in Wooded Port (both west of the passage), but at Yate on the east coast, which is the nearest place sufficiently protected by the reefs to enable observations to be made, it is high water nearly three hours earlier than at the entrance of Havannah Passage. Probably as a consequence the tidal streams are very variable in direction at the entrances of the Havannah and Sarcelle Passages. The result is violent eddies and a heavy breaking sea across the entrance of each passage, rendering it difficult to steer a ship except at high speed, and schooners are obliged to batten down their hatches. At springs the streams run at the rate of 4 miles an hour through each passage and 2 miles in the offing. It would be prudent to wait till the strength of the tide has abated.

Ships when bound to the northward should, on leaving Havannah Passage, round the reef on the port side as close as safety will admit, thereby immediately entering still water, and so continue to the northward, having inshore only the streams of ebb and flood to contend with, which are always moderate on the east coast. If on leaving the passage the course should be continued to the northeast or east, currents will be found varying greatly, both in strength and direction. It has often happened that vessels which hove to at night-fall about 2 miles off Havannah Passage have found themselves 25 miles to the northeast or a similar distance southeast at daylight.

Spring tides rise 4 to 4½ feet and neaps 2½ feet. The mean sea level is about 1½ feet higher at the time of the autumnal than at the vernal

equinox. In September and October the wooded islands within the reefs are sometimes invaded by the sea, while in March and April only the beds of coral round the islands are completely uncovered.

Within the great reef the tidal streams are moderately regular, though they are accelerated or retarded by a strong breeze. The flood runs to the northwest and the ebb to southeast. On the east coast it sometimes happens during strong southeast winds that the ebb tide is not felt and the stream runs constantly to the northwest. On both coasts the ebb runs out through the passes and the flood sets in.

Loyalty Islands (lat. 20° S. to 22° S., long 166° E. to 168° E.).—This group of islands is said to have been discovered in 1800; or by another version, in 1803.

The Loyalty Islands (now a French possession, as a dependence of New Caledonia) have not yet been completely surveyed; their positions, forms, and dimensions as shown on the charts now in use leave much to be desired.

The group is composed of five large islands—Maré (Britannia), N'dundure (Molard), Tiga (Boucher), Lifu (Chabrol), Uvea (Halgan); also the islets between Maré and Lifu—the Pleiades and Deguala groups.

Communication.—A steamer under the French flag runs between Noumea and the Loyalty Islands.

New Hebrides.—These islands, including Banks and Torres Group, consists of about 40 mountainous islands besides numerous islets and rocks. They are situated between the parallels 13° and 20° $30'$ south latitude and the meridians of 166° and 170° east longitude.

Geological formation.—The geological structure of the islands comprising the New Hebrides Group differ considerably. Some are entirely volcanic, others are of coral formation, whilst several are a combination of both. There are several active volcanoes in these islands, and earthquakes are not uncommon.

Government.—The government of the New Hebrides, by a convention signed in 1907, is under the joint control of England and France, each country being represented by a resident commissioner, the seat of government being at Fila in Efate Island. Fila is the sole port of entry.

Natives of the New Hebrides.—The natives of the New Hebrides Group comprise distinct races, and many subordinate divisions, the greater part belonging to the dark, crisp-haired Melanesian race, but there are some communities of relatively light-colored, straight-haired Polynesians. As a rule those belonging to the southern portion of the group are stronger and better developed than those farther north, many of them being robust, muscular men.

Many languages are spoken in the group, and consequently an interpreter however efficient at any one village is nearly sure to be useless elsewhere. For weapons they have clubs, spears, bows, and arrows, the latter generally poisoned, and in some places tomahawks. Firearms are becoming common and the natives expert in their use. Their canoes are rude in shape, clumsily made, and fitted with outriggers. They have no recognized chiefs, and as their lives are characterized by suspicion and constant quarreling, there is no security for either life or property.

Although an appearance of friendly confidence will often attend to allay their natural feeling of distrust, strangers visiting those islands would do well to maintain a constant watchfulness and use every precaution against being taken by surprise.

Natives of Malekula.—The natives can be divided into the “salt-watermen” and the “bushmen,” between whom there appears to be unceasing war. The offlying islands are densely populated by the former, who live there for the sake of security. They possess numerous canoes in which they cross over to the mainland opposite every morning to cultivate their crops of yams, bananas, etc., being careful to return before dark. Some of the canoes are very large, have a triangular matting sail, and are used in trading expeditions to Malo Island.

They are a wild savage race, and have the reputation of being treacherous, but of late years more frequent intercourse with white men and the presence of resident missionaries has done much to modify this. In the presence of a ship of war, at any rate, they always appear very friendly, having a good idea of the punishment that could be inflicted upon them in case of bad behavior.

Cannibalism is still occasionally practiced. Nearly all are armed with sniders. Many having been to Queensland in labor schooners speak a dialect known as *Bêche de Mer* English.

The “bushmen” live entirely among the hills in small villages and are seldom seen. Being practically secure from punishment, they have not the same reasons for good behavior that the “salt-water men” have, and should, therefore, be always treated with caution. All villages being hidden among the trees, it is only by the smoke that their presence can be suspected.

The natives along the south coast are of a decidedly more intelligent and better-looking type than those of any other part of Malekula. The custom of bandaging the skull during childhood to give an elongated shape to the head is everywhere practiced. They have always been found to be most friendly and obliging.

The natives of Ambrym appear to be of a similar race to the natives of Malekula, with which island communication is occasion-

ally carried on in big canoes. The western part of the island seems to be fairly populated and the natives perfectly friendly, wherever the influence of the mission at Dip Point has penetrated. Little or nothing is known of the natives along the southern and east coasts, and they should be, therefore, treated with caution.

Natives of Epi Island.—The southern and eastern parts of the island are not very thickly populated, the villages being small and far apart, but on the west side the natives are more numerous and were always found to be most quiet and inoffensive. A great deal has undoubtedly been done of late years by the Presbyterian Mission of Burumba toward civilizing the natives, and now, unlike other islands of the New Hebrides, little fear is apparently felt of the "bushmen" by the "salt-water men," and native messengers freely pass across the island from one side to the other.

Natives of Espiritu Santo.—The coast is very thinly populated compared to Malekula Island, and by a smaller and inferior race of men; they possess few canoes. Such natives as were met with appeared very friendly, but they have the reputation of being treacherous, and there have been many murders of white men in quite recent times, so they should be treated with caution. Cannibalism is probably more prevalent than in Malekula Island; the population appears to be decreasing.

Natives of Pau Uma.—The west side of the island is fairly populated, and the natives appear to pay great attention to their fruit gardens, from the large clearings that may be seen dotted about over the sides of the hills. A new spot being selected each yam season and the fences quickly sprouting, the hill sides in places look like overgrown fields with thick hedges. At the northwest corner of the island the natives, on the British naval vessel *Dart's* first visit, were very suspicious and even threatening, but were quickly reassured and always friendly afterwards; however, they should be treated with the greatest caution, as this corner has been notorious, even in quite recent years, for attacks on boats of labor vessels. At the anchorage and everywhere else around the island they were perfectly friendly. At Southeast Point, during the great hurricane of 1893, a Frenchman and his native boat's crew were cast ashore and were treated with the greatest kindness for some days, until picked up. The natives of Pau Uma have a bad reputation among the natives of the neighboring islands.

Products.—The produce of the islands which forms the chief articles of export consists of copra, bêche-de-mer (fish of excellent quality), sandalwood (which is nearly exhausted), and sea shells for making buttons. Coffee is an increasing industry; the cultivation at the present time is done by the French.

The imports, chiefly articles of food and manufactured goods for the use of the white settlers in the group, come from New Caledonia and Australia. There is a large amount of live stock which has been imported into the group, and interisland trading takes place, pigs and goats being the most sought after.

Ports.—The best harbors in this group are ports Aneityum, in the island of the same name; Havannah Harbor, in Efate Island; and Port Sandwich, in Malekula.

Supplies.—Some pigs, goats, and fowls can be obtained at most of the islands, besides vegetables and fruit.

Communication with Australia is maintained by one of the Australian Union Steam Navigation Co.'s vessels from Sydney, monthly to Havannah Harbor or Fila, on their passage to Fiji. A small French steamer from Noumea also visits the group monthly, calling at Fila, Havannah Harbor, Port Sandwich, and Santo Island, in addition to an interisland service, by which a steamer visits all the islands and meets the Australian Union Steam Navigation Co.'s steamer at Fila.

Climate—June.—British naval vessel *Dart* commenced surveying in the vicinity of Epi and Ambrym Islands on the 5th instant. From this date to the 12th, inclusive, almost incessant rain was experienced, with winds from east to east-northeast, until the 11th, when it was northwest for two days. It was stated that similar wet weather had been experienced uninterruptedly since the hurricane of March 5. Fine weather commenced on the 13th, with good strong trade from south to east, and from the 26th to the 29th northeast. On the 29th, the day of full moon, the barometer became very unsteady, and in the evening strong southeasterly wind with rain set in and lasted to the end of the month.

Rained on 15 days; barometer, 30.22 to 29.92 inches; thermometer, 86° to 69°.

July.—Southeasterly blow until the 3d, shifting through east to northeast, and then clearing up with fine weather and light southeasterly winds to 7th, when light breezes from west and northwest with rain; on 8th, south-southwest, with swell coming in from southwest; then fairly strong trade from east-southeast; blowing hard with rain on 11th, and from 19th to 27th very strong southerly to southeasterly and easterly winds with fine weather; then calms and variable to end of the month.

Rained on 14 days; barometer, 30.30 to 29.98 inches; thermometer, 86° to 64°.

August.—The month commenced with strong northeasterly winds with frequent and heavy showers until the 5th, when it became more easterly and fine; on the 8th strong blow from the eastward with thick weather and heavy rain, similar weather more or less lasting

till the 13th, when a light southwesterly wind for a few hours was experienced, then blowing strongly again from east-southeast with heavy rain squalls until the 26th, when fine weather and calms set in.

Rained on 23 days; barometer, 30.20 to 30.04 inches; thermometer, 84° to 73°.

September.—Fine weather, with light variable winds, generally to 23d; heavy rains on 7th and 12th; from 20th to 22d fresh westerly winds; from 23d to the end of the month, strong easterly winds with occasional heavy rain.

October.—On October 1 British naval vessel *Dart* left for Noumea, heavy, thick, rainy weather with strong northeasterly winds. At 10 p. m., when off Efate Island, an electrical storm, commencing with incessant sheet lightning, followed by a very heavy squall from the southeast, was experienced with deluges of rain during which Saint Elmo's fire was plainly visible for about half an hour on the extremity of the masthead spindles. Strong east-southeasterly winds, with bad weather continued till 12th, when fine weather set in. The *Dart* returned to the New Hebrides on the 17th. Fine weather continued for the remainder of the month, with light northeasterly to south-easterly winds and occasional rain.

Rained on 19 days; barometer, 30.22 to 29.90 inches; thermometer, 84° to 75°.

November.—A very fine month. On 4th and 5th heavy thunderstorms with much rain and strong squalls from southwest to northwest; heavy swell set in from the southward between 6th and 11th, but weather perfectly fine. Winds light, southeasterly to northeasterly, with occasional calms and thunderstorms throughout the month. The *Dart* left the New Hebrides on 24th, and Noumea on 29th for Sydney, the fine weather continuing.

Rained on 5 days; barometer, 30.16 to 29.90 inches; thermometer, 87° to 73°.

Generally it was a finer year than 1892, the trade wind was more felt, probably because the survey being more on the weather side of the group, but the direction of the wind was more often to the northward than to the southward of east.

Rainfall.—From records kept at Tangoa, Espiritu Santo Island, from 1882 to 1892 it appears that there is no recognized rainy season, though on the whole perhaps November is the wettest month and June the driest.

The southeast part of part of Santo appears to be wetter than Malekula, probably on account of the high mountains of Santo.

The Banks Islands (lat. 13° 48' S., long. 167° 05' E.), a high volcanic group north of the New Hebrides.

Government is the same as the New Hebrides.

Natives of Banks Group.—The total population of Banks Islands is about 5,000, but diminishing in numbers year by year; the males are more numerous than the females. The inhabitants are of a type distinct from any of the New Hebrides group in manners, customs, habits, language, and appearance; the difference being so marked that a Banks islander can be identified by those acquainted with the natives of these regions. In character they are, with the exception of the natives of Gaua, mild, quiet, inoffensive, and friendly. The bow and arrow is the universal weapon. They have a separate language of their own, with different dialects in some of the islands, but quite distinct from any language spoken in the New Hebrides or other islands. The Mota dialect is the one most commonly used and understood by all. English was found to be spoken well by several natives in every village visited and by those who came off to the *Dart*.

Their gardens are carefully attended to, but they only grow sufficient quantities barely to supply themselves.

Syphilis is very prevalent. Ulcers are common, and are produced to a large extent by a very poisonous plant named "salata" that grows extensively all over the group, a touch from which makes a mere scratch an ugly sore. In certain districts there is much fever.

Harbors.—The only harbors in the group are Port Patteson, in Vanua Lava (discovered by Bishop Patteson in 1857) and the harbor in Ureparapara Island.

Products.—These islands produce similar things to the New Hebrides—that is, breadfruit, coconuts, sago, bananas, nutmegs, sugar cane, taro, arrowroot, sweet potatoes, and yams. There are also a few pigs.

Climate.—The general mean temperature at these islands during May and June is about 84; and the temperature of the sea is about the same as the air about nine hours in the morning.

Tucopia Island, in latitude 12° 21' S., longitude 168° 43' E., it is about 7 miles in circumference and 1,235 feet high. It belongs to Great Britain.

Natives.—The inhabitants of Tucopia are Polynesians, and are mild and inoffensive.

Supplies are scarce and dear, although the island is well cultivated.

Anuda (Cherry) and Fataka (Mitre) Islands, in latitude 11° 38' S., longitude 169° 51' E., were discovered in 1791. They belong to Great Britain.

Santa Cruz Islands, lying between the parallels 9° 30' and 11° 00' S., and meridians 165° 30' and 167° 30' E.

Protectorate.—The group belongs to Great Britain, and is attached to the administration of the British Solomon Islands.

The natives of Santa Cruz Group are a fairly athletic-looking race, comprising more or less of a mixture of the two great races

inhabiting the southwestern Pacific; they come off readily to the ship, bringing pigs, breadfruit, and yams; mats, in the manufacture of which great skill is displayed, are also offered for sale, pipes, tobacco, and other articles being the medium of exchange. The appearance of their canoes and houses evinces great ingenuity; the canoes, with outriggers, and the houses mostly limewashed, having a neat appearance; they have also large seagoing double canoes. The villages are large and the habitations, which are low, small huts of a circular shape, are surrounded by stone fences. On the north side the villages are close to the sea, with from 300 to 400 inhabitants each.

The natives are apparently merry and good-natured, but should not be trusted, as many instances of their cruelty and treachery are on record. Their bows are formidable-looking weapons.

Climate.—The climate of the island is damp, hot, and unhealthful even to the natives, who are covered with ulcers and are often sick; therefore it is deadly for Europeans.

Solomon Islands.—The Solomon Islands were discovered in 1567.

Protectorate.—The two westernmost islands of the Solomon Group, namely, Buka and Bougainville, and the small islands adjacent to the latter, are under the protection of Germany. The remainder of the group, from Choiseul and Mono or Treasury Islands eastward, are under the protection of Great Britain.

The deputy commissioner, under the high commissioner of the Fiji Islands, resides at Tulagi, in Florida.

Population.—The white and foreign population of the protectorate in 1905 numbered 110, of which 75 were British subjects. The native population can only be roughly estimated, but is not less than 150,000, Mala or Malaita Island being the most populous.

The inhabitants are described in the body of the work.

Trade is gradually developing. The principal articles of export are copra, ivory nuts, pearl shell, of which 3,259, 1,419, and 22 tons, respectively, were shipped in 1904-5; the other exports are turtle shell, bêche-de-mer, rattans, coconuts, palm seeds, and plants. The imports are tobacco, foodstuffs, hardware, timber, drapery, and boats. The search for minerals has not yet been successful.

Planting coconuts is the principal branch of agriculture engaged in by white men, and in 1905 there were 3,423 acres planted. It is expected that rubber will be grown successfully, and rice and a variety of cotton, named "Caravonica," have been experimentally cultivated with good results. Sweet potatoes, pineapples, and bananas are grown.

The Solomon Islands (German portion) are placed under the officials of Kaiser Wilhelm Land. Sandalwood and turtle shell are the chief commercial products.

Ports.—Tulagi, in Florida Island, Shortland Harbor, and Gizo are the ports of entry.

Communication.—A direct service of steamers between Sydney and the Solomon Islands via Brisbane six times a year was commenced in 1905. The Milanesian Mission steamer visits the Solomon Islands three times annually, also other groups beyond the limit of this work.

Neu Pommern (New Britain) and Neu Mecklenburg (New Ireland).—The northeast coast of Neu Mecklenburg was discovered by Le Maire and Schouten in 1616, and was also seen by Tasman in 1643. It was considered by these navigators to form a portion of the large island of New Guinea; this idea was, however, dispelled by Dampier in 1700, who sailed through the strait now bearing his name.

In 1767 Carteret found that the so-called St. Georges Bay of Dampier was in reality a strait, separating two distinct islands, henceforth the eastern one was named Neu Mecklenburg and the western one Neu Pommern, the strait separating them being named St. Georges Channel. Both these islands, especially Neu Pommern, are still imperfectly known.

The Admiralty Islands were discovered in 1616.

Protectorate.—A German protectorate was established in November, 1884, over Neu Pommern, Neu Mecklenburg, and the islands included in the area between the Equator and the parallel of 8° S. and from the meridian of 154° E. to the coast of New Guinea. These and the islands off the coast of New Guinea, as far westward as the meridian of 141° E., have been named the Bismarck Archipelago.

The inhabitants are described in the body of the work.

Trade.—Cotton and coconut palms are cultivated. The New Guinea Co. has a trading station at Matupi and other places. The chief exports are copra and coconut fiber.

Marshall Islands.—This group consists of two chains of atolls lying nearly parallel to one another in a north-northwest and opposite direction, the eastern group being named the Ratack and the western the Ralick Chain.

The group consists of about 30 groups of low coral islands and islets, some without lagoons, but the greater number being fully formed atolls, some of considerable extent.

Natives.—The natives are an active and intelligent race and fearless navigators. They possess large canoes.

Communications.—A steamer makes quarterly trips between Sydney and Marshall Islands.

The Pacific Steam Navigation Co. charter sailing vessels of 20 to 100 tons about every three or four months from Honolulu to their station at Jaluit.

Supplies.—Fresh water of a very fair quality can be procured from pits or wells near the center of Burr Islet; casks could be filled and rolled to the beach. Wood may be procured in small quantities; a few fowls and pigs can be procured.

Caroline Islands.—Many of the principal groups of this archipelago were discovered by the enterprising navigators, chiefly Spanish, of the sixteenth, seventeenth, and eighteenth centuries. They were sighted (some of them) in 1526, and in 1528 were described under the name of *Islas de los Reyes*, what may be taken as the Uluthi Group. Ponape was probably discovered in 1595, and in 1625 the Nassau fleet recorded the existence of Yap, which, however, had been seen by Drake 40 years earlier.

In 1686 islands were discovered in this part of the Pacific and called *Islas Carolinas*, after the consort of Carlos II of Spain, hence the name adopted for the whole archipelago, of which the Palau or Pelew Islands are now considered to form a part. These latter islands were probably discovered in 1542, but they first attracted attention in consequence of the wreck of the East India Co.'s vessel *Antelope*, in 1783, when the crews were furnished by the natives with the means of building a vessel in which they proceeded to China, taking with them the king's second son, Prince Li-bu, who, however, died shortly after his arrival in England.

It is to the voyages of the French ship *La Coquille*, 1824, and of the Russian corvette *La Sèniavine*, 1828, that we owe most of our geographical knowledge of these islands; but it should be borne in mind that the positions assigned to the various groups, and the loose descriptions given of them by the earlier discoverers, do not permit of their ready identification with the various islands as at present known.

The Carolines consist of about 500 coral islets. The Palau Islands are about 26 in number, mostly coral, and many of them uninhabited. The largest is Babelthuap, which contains the bulk of the population.

The sovereignty of the Carolines, including the Palau, or Pelew, and the Marianas, was ceded (declaration made at Madrid, February 12, 1899) by Spain to Germany, except Guam, of the Marianas, which was ceded to the United States of America in 1898.

Population.—In 1906 the population of the East Carolines consisted of 77 Europeans and 42,142 natives; of the West Carolines, 73 Europeans and 13,187 natives; and the Palau Islands in 1904 were estimated to have 3,101 inhabitants.

The natives are well formed and of a light copper complexion, the men usually being elaborately tattooed. They are generally apparently friendly and often go about unarmed, but it can not be said that they are entirely to be trusted.

Many different dialects are spoken, but they are evidently all of Malay origin, and are strongly allied to the language spoken in the Marshall and Gilbert Groups. There are also some Chinese and Japanese.

Trade.—The sale of firearms, explosives, and alcoholic liquors to natives is prohibited. The exports are principally copra.

Ports.—The principal ports are Ponape Haven, in Ponape; Korror, in the Palau Islands; and Tomil Haven, in Yap.

All vessels touching at the Carolines must call at one of these ports and obtain permission to visit other islands of the group.

Communication.—There is monthly mail communication between Ponape, Yap, and Manila.

Yap has telegraphic communication by cable with Guam, and thence with San Francisco, via Honolulu; also with Menado and Shanghai, and it is proposed to connect Yap and Simpson Bay by cable.

The Marianas—General remarks.—This archipelago is composed of a chain of volcanic islands which extend in a north-and-south direction for a distance of 450 miles. Magalhaens, the first circumnavigator, discovered them on March 6, 1521, but he only saw Saipan, Tinian, and Guam. The Spaniards, who colonized them, named them *Ladrones*, from the supposed great propensity to thieving evinced by the natives, and this name they retained until 1668, when they received the name of Mariana, in honor of Maria Anna, of Austria, the widow of Philip IV, King of Spain.

With the exception of Guam, which belongs to the United States, the islands, formerly Spanish, now belong to Germany. Guam has an area of about 200 square miles.

The only inhabited islands are Agrigan, Saipan, Tinian, Rota, and Guam. The active volcanoes of the group are on Alamagan, Pagan, Uracas Island, Assongsong, and perhaps Guguan.

Flora and fauna.—The principal trees on Guam are wild bread-fruit of great size; giant banyans, tall trees with hard mahoganylike wood; ironwood trees; and betel palms.

Besides rats and mice the other mammals are a large fruit-eating bat or flying fox, a small insectivorous bat, wild hogs, and a species of deer, introduced about 1773, which is now so abundant as to cause serious damage to crops. Goats are found on the outlying islets, and cattle and water buffaloes have been introduced.

Doves, flycatchers, and honey eaters are common, and there is a swift that makes edible nests and a species of wild duck which is peculiar to the island. Curlews, herons, and several shore birds are found, and the Chinese partridge has been introduced.

The reptiles include a large lizard which eats young chickens, pigeons, etc., and there are several species of land crabs.

Population.—The population of The Marianas is composed of Spaniards, Chamorros (the aborigines), and Caroline islanders, the latter having been imported into the islands at various times since 1866. They are more vigorous than those of the Philippine Islands. and they seem to be intermixed with the Malay race.

In 1904 the population of the islands, exclusive of Guam, numbered 2,646, of which 23 were Europeans; and Guam had 9,700 inhabitants, exclusive of about 50 foreigners.

Products.—Guam produces maize, copra, rice, and sugar and has valuable timber. There are about 4,000 head of cattle and over 700 water buffaloes.

Trade.—The exports of The Marianas is almost entirely copra.

Harbors.—Port Apra, in Guam, and Tanapag, in Saipan, are the only two ports properly so called in the Mariana Group; the others are nothing more than bad roadsteads.

Communication—Steamer.—There is a monthly mail service between Guam and San Francisco.

Telegraph.—Guam has telegraphic communication with Honolulu by a cable which touches at Midway Island. There are also cables to Yokohama, Manila, and Yap, which latter island is in cable communication with Shanghai and Borneo.

Guam has a United States naval radio station. Call letters, N. P. N.

Money.—The currency consists of Mexican silver dollars, with some United States coin.

Standard time of the meridian of $142^{\circ} 30' E.$ from Greenwich has been adopted.

Regulations for foreign naval vessels.—All foreign vessels of war are required to obtain permission from the Secretary of the United States Navy through their respective diplomatic representatives at Washington and the State Department before visiting the island of Guam.

Winds and Weather.

The following is a general description of the prevailing winds over the several groups of islands included in this work; a more detailed account for particular places will be found in a detailed account of the several groups.

The winds over the portion of the western Pacific, south of the parallel of $4^{\circ} N.$ and east of $140^{\circ} E.$ to as far east as the Solomon Islands, partake generally of the character of monsoons, blowing alternately from about southeast and northwest, the former from April to October, and the latter from November to March, but these general characteristics are slightly varied by local circumstances in New Guinea and in the different groups.

The change of the monsoon is usually preceded by variable winds, squalls, and calms. The southeast wind frequently blows with considerable force, and is often accompanied by hazy weather, particularly over the high land. The northwesterly wind, which blows during the wettest season, is attended with clouded overcast weather, squalls, and heavy rain. North and northwest of the limit stated the southwest monsoon of the China Sea blows during June, July, and August, and for the remainder of the year the northeast trade wind prevails.

The climate of the islands in the western portion of the area covered by this book presents some variations, but with few exceptions it is unfavorable to Europeans, and it is rare for them to make any continued residence in many islands without more or less injury to health. It may be said that the low-lying marshy lands of parts of New Guinea, Neu Pommern, and some of the islands of the Solomon Group possess a more or less deadly climate for the inhabitants of more temperate latitudes, and in the Solomon Islands and Neu Pommern the excessive humidity, together with the enervating season of the northwest monsoon, makes their low-lying lands peculiarly noxious. In the latter island the month of April, being the close of the rainy season, when the sun is drying up the swamps in the interior, is the worst, the malaria then being spread over the country by the land breeze.

The exceptions above alluded to are the Carolines, all of which are said to be at least as healthy as other tropical climates, and are reported to have the most equable temperature in the western Pacific.

Malarial fevers, dysentery, and ague are peculiar to most of the groups, ulcers are common, and elephantiasis is occasionally met with. A loathsome skin disease (*Tinea desquamans*), known as the "Tokelau ringworm," prevails more or less over the whole area, but is very prominent in the Solomon Islands and New Guinea, though the natives do not seem to be inconvenienced by it.

Winds in New Caledonia.—The trade wind from southeast and east-southeast prevails generally in New Caledonia, and is more constant in the northern part of the island than the south. The force and direction of the wind often present singular anomalies in the south, and fixed rules can not be given on the subject. During the whole year, but principally at the commencement of the fine season, the part about Noumea is exposed to a series of breezes from northwest and west, which are sometimes very strong, accompanied by gales and torrents of rain; while the east coast enjoys a pleasant breeze from southeast. Sometimes these squalls come suddenly, but they do not retain their violence more than two or three hours, then shift to southwest and south, with a clear sky. These squalls gen-

erally succeed a breeze from northeast, or follow calm dull weather; they seldom occur except when the barometer is between 29.68 and 29.82, and are sometimes so local that one vessel moored at Uitoe and another at Noumea each experience a strong breeze simultaneously, the first from east-southeast, the second from west-northwest. Those winds may have formed a part of a gyratory gale, having no progression and being circumscribed within the space 10 miles.

Sometimes the wind will be from northwest on the east coast, while it is southeast on the west side. Havannah Passage, in consequence of its position at the extremity of the island, is subject to frequent changes of wind, both in force and direction. When the wind is southwest off Cape Ndua, it may be southeast or east-southeast at the outer part of the passage; when in the offing the breeze is light from northeast, it is generally north at the entrance of the passage, and off Cape Ndua it may be northwest or even west-northwest.

On the east coast, between June and December, if after some days' calm, the weather should become foggy, with a falling barometer, a gale is almost certain; or at least a sudden squall without warning. A fresh gale from east-northeast or northeast, accompanied by squalls and torrents of rain, lasting more than 12 hours, with a falling barometer, will haul to north and northwest, blowing from that quarter with great violence during some hours, and finally terminate at west and southwest with clear weather. The west side of the island is sheltered completely from bad weather when the wind shifts rapidly from east-northeast to northwest, and the Bays of Noumea and St. Vincent remain in a calm with a clear sky overhead.

When the trade wind becomes established in full strength, the weather at the southeast extremity of the island changes, and the squalls become frequent and sometimes violent; but that action extends very slowly on the east coast. The squalls meet with great obstruction from the mountain masses of Unia and Yate; there is a moderate breeze and clear sky at Tupeti four or five days after a stiff breeze with fog and rain has set in at the entrance of Havannah Passage. In general and under the normal conditions of the atmosphere, the trade wind from east-southeast commences near the shore about 8 a. m., blows with some force at 10 a. m., and acquires its maximum strength about 2 p. m.; and finally lulls to calm at sunset. In the offing and beyond the reefs the greatest force is always between 6 and 7 in the evening.

The land winds are rather frequent on the west coast, which may almost be called the lee side of the island, but are rare upon the east side, which is generally swept both day and night by a breeze from

the sea. They never extend to the outer or barrier reef and are only felt in the large valleys, at Yate, Unia, Kanala, and Pueblo. They usually cease about 8 a. m. Following the line which joins the Valley of Tchio to Uaria, there exists throughout the whole width of the island a depression which separates the mountain mass (of which Mount Humboldt is the summit) from the central mountain. That opening causes the south-southeast wind on the west coast to become a very fresh southwest wind, especially during the night.

The northern part of New Caledonia being narrower and lower than the rest of the island, also being in a latitude where the trade wind is more regularly established, the land exercises less influence. The breeze there is generally stronger and more continuous; nevertheless that part is exposed, particularly in September and October, to very violent storms from the westward, preceded by dull, misty weather, charged with electricity, and a dead calm. During the first four months of the year the winds are irregular and often very strong.

It happens sometimes in the fine season that the southeast wind suddenly blows very fresh and continues so during 8 to 15 days. That increase in the force of the wind generally commences in the morning with a bank of thick white clouds with sharp edges rising rapidly on the horizon.

The appearance of the rising or setting sun is a tolerably certain sign of the weather which will prevail during the 12 hours following. When at sunrise or sunset the horizon is clear, showing a beautiful orange red and above all crossed by small streaks, fine weather and a light breeze may be considered sure. If that tint should become livid and a mist appear around the sun, a strong breeze with squalls may be expected. If the sun appears white and foggy, bad weather is almost certain. This warning is not to be despised when navigating within the reefs.

During May and June the wind again becomes fresh and irregular, with frequent squalls. In July and August the weather is generally fine and dry, with a steady trade wind. September and October are the finest months in the year, with a regular and moderate breeze, temperature mild and equal, rain very rare. About the middle of November strong breezes and squalls commence, and Christmas day may be considered as the commencement of the bad-weather season.

It is considered that the external reef exercises a great influence on the force and direction of the wind. It often happens that the weather is fine within the reef, while the sea in the offing is swept by strong southeast winds, with a cloudy sky and rain. When vessels leave Nouméa with a northwest wind, they often find outside the pass a westerly or southwesterly wind, with clear sky. If, on the contrary, they leave with a southeast wind, or even at east-southeast,

they find outside that the wind is from south-southeast or from south. It is rare during settled weather and a moderate breeze inside not to find very light winds and sometimes even a calm in the passage.

Winds in New Hebrides Group.—The prevailing winds here are similar to those prevailing in New Caledonia. During the stay of the British surveying vessel *Dart*, July to November, 1893, no real trade wind was found to prevail, though, as a rule, there was easting in the wind; and when the weather was settled and fine, east-southeast in direction.

Except when blowing hard during the day, the wind always fell light or calm during the night.

Apparently the trade wind does not blow home, as away from the islands on passage to and from Nouméa a fresh trade was always experienced from southeast to east-southeast.

Winds in Banks Islands.—The winds about Banks Islands are governed by the same laws as at New Caledonia and the New Hebrides, only that the hurricanes which are experienced in the southern part of the New Hebrides are seldom felt in the Banks Group.

Hurricanes.—The details of the rotary storms or cyclones occurring among the islands of the southern Pacific are not so well known as those in other oceans, but they are experienced from December to April.

These hurricanes are experienced in great severity among the Fiji, Tonga, and Samoa Groups; also among the New Hebrides, and the laws which govern them coincide with the laws governing all rotary storms in the Southern Hemisphere.

In a short treatise published by a former director of the meteorological observatory at Tokyo, Japan, it is stated that of 125 cyclonic storms of which particulars had been obtained the tracks of 74 passed through the Samoa, Fiji, and Tonga Groups, 40 passed westward of that area, and only 11 passed eastward of it.

A very destructive hurricane passed over Fortuna in the New Hebrides in February, 1893, the wind shifting from south-southeast, through southeast and northeast, to northwest.

For practical rules to follow in the handling of a vessel in a hurricane the mariner is referred to the American Practical Navigator, Bowditch.

The Solomon Islands.—The fine weather or dry season among the Solomon Islands may be said to extend from May to October, being the season of the trade wind; occasionally much rain falls in the so-called dry season, and is generally accompanied by a change of wind from the eastward.

The normal direction of the trade winds is from east-southeast, but the stronger winds, which usually succeed calms, are from southeast, though they are, even in the best season, far from steady, and

as a rule calms may be expected when the wind backs to east or northeast.

When in the vicinity of the islands the prevailing trades are frequently interrupted and calms occur followed by easterly and northeasterly breezes accompanied by rain; occasionally the wind backs around, by way of north to west, and when this occurs some disturbance, viz, a gale, a squall, a thunderstorm, or rain, may be expected.

The trade winds generally blow stronger and with more regularity in the southern part of the group than in the northern portion.

From November to March, the northwest monsoon period, is the wet season. Calms and variable winds are the rule in the southeastern parts, with an occasional spell of severe weather from the northwest, generally accompanied by torrents of rain.

In the western part of the group the westerly winds seldom begin until December, blowing hard at times in January and February and ceasing in March.

Climate.—To persons acclimatized the Solomon Islands are probably as healthful as most tropical climates. New arrivals are almost certain, sooner or later, to suffer from malarial fever, but in a comparatively mild form, and not of so severe a type as the fever met with in New Guinea. The natives are also subject to it. The most unhealthful season is during the northwest monsoon, particularly the latter part of it.

The crews of vessels remaining any considerable time in this group find wounds and sores liable to change into malignant ulcers. This is probably owing to the lack of fresh meat combined with a scarcity in variety of the vegetable food obtainable.

The range of temperature is small and the heat is rarely oppressive. A temperature of 90° in the shade is considered high; in the early morning it generally falls to about 77°, and upon cloudy days stands at about 80° to 82°.

Rainfall.—In all the islands included in this work the rainfall is very large, and it falls with tolerable regularity throughout the year, though the northwest monsoon is generally considered the rainy season, and is the most unhealthy, particularly the latter part of it.

In the Solomon Group the annual rainfall from seven years' observations (1897-1905) at the Government station, Tulagi, averaged 127 inches, but in the interior of the higher islands it is probably much larger. The greatest average quantity of rain during any month was 18 inches in March, and the least 5.4 inches in June.

Marau Sound, at the southeast end of Guadalcanal is during the southeast season probably one of the wettest places in the protectorate. The clouds carried by the trade wind appear to be arrested by the high mountains and precipitate themselves in rain. Tulagi escapes this altogether.

Barometer.—The barometer stands highest from about June to September and lowest in January and February, but the mean variation is small.

Neu Pommern, Neu Mecklenburg, and Neu Hannover.—From the middle of April to the middle of October southeast and easterly winds blow with tolerable regularity, generally fresh, but moderating between March and June; during this season the rainfall is small and fresh water is therefore scarce. The northwest monsoon commences in November after a month or six weeks calm weather, the wind blowing strong, at times in violent storms, until February, accompanied by much rain. From mid February to mid April calms precede the southeast trade.

In the vicinity of Neu Hannover, Neu Mecklenburg, and Neu Pommern the southeast trade wind appears to be deflected by the high land of those islands and to blow principally along the coasts. In the months of July and August, on the northwest coast of Neu Hannover, the wind was northeast, and on the southwest coast of that island and of Neu Mecklenburg southeast and south-southeast, but light and often interrupted by calms, the wind seldom attaining a force of from 3 to 4.

Climate and rainfall.—In the northeast part of Neu Pommern the mean monthly temperature during 1883–84 was 78° and the means of maximum and minimum temperatures 94° and 66°. The average number of days on which rain fell was 180 in each year, mostly in the northwest monsoon season.

The southeast trade season is called the dry season, and it is also the most healthful. A land breeze usually blows at night.

Duke of York Group.—During the southeast trade season light breezes commence about 8 a. m. and freshen toward noon, the lighter the breeze in the forenoon the stronger it will be in the afternoon, and as a rule it dies away toward sunset. This wind sets in strongest about the end of June, accompanied by squalls and rain, and ceases about September, from which time until December variable winds may be expected.

The northwest monsoon begins in December, when the weather is generally squally and wet; February and March bring fine weather, and from the latter month until the southeast season commences the winds are light and variable.

Barometer—Temperature—Rainfall.—The barometer rises for easting in the wind, falls for southing, and remains steady with the wind at southeast. The variation is very small and subject only to regular daily fluctuations, standing highest at about 9 a. m. and from 73° to 87° F.

The temperature during the months of July and August ranges from 73° to 87° F.

Rain is abundant on the coasts of Neu Hannover and Neu Mecklenburg, and judging from the vegetation these islands are subject to a heavier rainfall than the northern part of Neu Pommern.

Admiralty Islands.—The *Challenger* arrived at Nares Harbor on March 3 and left on March 10, 1875. During this period the barometer ranged between 29.90 and 30.05 inches; the mean temperature of the air was 81°, and of the sea water 83.8°. Rain fell on five days, the total fall being 2.81 inches, the greatest fall in any one day being 1.21 inches.

The wind prevailed from the northward, being noted as having blown 36 times from that direction, twice from northeast, twice from east, twice from south, twice from southwest, 7 times from west, 9 from northwest, and 12 as calm or light and variable. The average amount of cloud was 8.5. The average speed of the wind was 7.6 miles per hour. The atmosphere was damp and oppressive, the wet and dry bulbs being rarely separated 1°, and frequently registering the same temperature.

In the vicinity of Hermit Islands the northwest monsoon is said to set in generally in December with about three days bad weather; it sets in sometimes, however, in October.

At the Purdy Islands in 1888 the northwest monsoon set in on the 23d of October.

During the cruise of the British naval vessel *Alacrity* in 1874, while at anchor off the west coast of Admiralty Island, the northwest monsoon commenced on the 1st of November with a gale which lasted until the 15th, after which the wind was light and variable until the early part of December, when it blew steadily from the northwest.

This region during the interval preceding the westerly monsoon is subject to calms, interrupted by squalls, either from northeast or northwest, generally, however, from the northeast, which do not blow strong, but are accompanied by rain, while those from northwest blow stronger and last longer.

Marshall Islands, between 4° and 12° N. The northeast trade blows nearly all the year round, though it varies considerably in strength. From December to May it is strongest and most steady. During the summer months, however, westerly winds and violent squalls are sometimes experienced and much rain falls.

Caroline Islands.—The northeast trade blows over the group with tolerable freshness and steadiness from the beginning of October to the end of May, although its appearance is often advanced or delayed as much as one month. The southwest monsoon prevails

during June, July, and August, but is frequently broken by short spells of easterly winds. Rain falls all the year round, but the rainy season proper occurs between June and October. The climate is pleasant, and the rainy season is the least healthful. Though hurricanes are unknown, strong southwest gales generally blow toward the close of the monsoon season late in August or September. This is also the season of very light winds, when sailing vessels get about among the islands with difficulty.

At Ponape, in the eastern group, the trade wind is later in establishing itself, and its appearance is often delayed until January. In the early months it is fresh with violent squalls of wind and rain, and blowing hard for several days at times. In June it is replaced by calms and variable winds, which continue until November or December.

From June to December gales from southwest and from the eastward are frequently felt, which appear to have their origin in cyclones which form in the vicinity of the islands.

Rainfall.—There is rain during the whole year, the average number of days on which rain falls amounting to 250, but the rainy season proper may be considered as from June to October, the period of variable winds, and the dry season from December to June, or the trade-wind season. Thunder and lightning are of rare occurrence; thunder occurs about 80 times and lightning 140 times during the year.

Marianas or Ladrone Islands—Winds, climate, etc.—The Marianas lie within the region of the northeast trade and are under the influence of the northeast monsoon while that wind is blowing in the China Sea; while from June to October the southwest monsoon exercises more or less control over the prevailing winds. During January, February, and March the prevailing winds are northerly to northeast; in April, east-northeast to east-southeast; in May, east to south; in June and July, southeast to southwest; in August, September, and October, south to west; in November and December, west to northeast.

The mean monthly temperature is highest in August, 79°, and lowest in February and March, 73°. The barometer has a mean monthly range not much exceeding one-tenth of an inch, varying from 29.80 in the later summer months to 29.90 in the later winter months.

In the first three months of the year rain squalls known as Churadas occur; from April to June the weather is generally fine; the rainy season, from August to November, is the least healthful, and in these months the strongest winds are experienced, mostly from the westward, and thunder storms are of frequent occurrence. See remarks on typhoons below.

Earthquakes are frequently felt in the Mariana Islands, but are not often violent; the most recent, occurring in September, 1902, caused serious injury to the building used as the Marine barracks and killed several natives.

Cyclonic storms.—In some parts of the southwest Pacific cyclonic storms occur occasionally, but there are no records of these storms being experienced amongst the more western groups (within 10° of the Equator) westward of the New Hebrides, and in the Carolines none have been observed, though gales occur between June and December.

Typhoons.—In the Palau or Pelew Islands the typhoons of the China Sea are occasionally felt between the months of August and November.

In a period of 25 years 15 typhoons were recorded at Guam in the Marianas. These may occur at any time, as two of the above passed over the islands in February, three in April, one in June, one in September and eight in November, but they may be generally expected at the changes of the monsoon, and are often most frequent in the months of October and November.

ROUTES.

For all practical purposes of navigation between the various groups or isolated places included in this work it will be sufficient to draw attention to the fact that they lie within the limits of the trade wind and of the equatorial current. For sailing vessels this means a fair wind and current from eastward to the westward, excepting with regard to currents when within the limits of the counter equatorial current, and a beat to windward against the current and a choppy sea, in the opposite direction. Vessels of auxiliary steam power would be placed under similar conditions, and those of full steam power would take a direct course.

New Zealand to New Caledonia, Fiji, or Samoa, and Back.

All vessels.—Direct as possible, both ways.

The southeast trade blows with tolerable regularity among the above groups of South Pacific islands from April to October; but from December to March the winds are very light and uncertain, and are often from the northwestward. Hurricanes are likely to pass over these localities during the first three months of the year. In approaching New Zealand, especially in the winter months, a vessel should be westward rather than eastward of the direct route, westerly winds being the ones most likely to be experienced as southing is made.

Between the Various Groups of Islands in the Trade Winds of the Pacific Ocean.

Full-powered routes.—As direct as possible.

Sailing routes.—Vessels provided only with auxiliary steam power have, for the purposes of navigation in the regions of the trade winds, few advantages over sailing vessels, for they must follow nearly the same track. From east to west there is no difficulty, as the winds are fair. From west to east, for short distances, a vessel may beat or steam; but for long distances, as, for instance, from Fiji to Tahiti, a vessel should stand through the trade into the westerlies, thence making easting, and reenter the trade on about the meridian of the island bound to.

Caution.—Particular and constant attention must be paid to the direction and rate of the currents, which, near the islands, is sometimes deflected and always accelerated; most of the islands are so low that it is often impossible to see them at night, and ships are driven on the encircling reefs without any warning whatever; the lead as a rule gives no indication of danger, the reefs having very deep water close-to.

Between America and the Pacific Islands.

Full-powered routes.—From the islands to the coast follow the great circle track, and from the coast to the islands the rhumb line.

Sailing routes.—When bound for the islands from ports on the coast of North or South America, a glance at the Pilot Charts will show the advisability of getting into the trade wind as soon as possible and then running with it to the destination.

From the islands, vessels must cross the trade winds into the westerly winds to making easting, and thence coast along to their ports.

General remarks.—The tracks recommended between Sydney and the eastern part of New Guinea, the Solomon, and the Caroline Islands for other than full-powered vessels, are those usually followed by vessels bound to China by what are known as the middle and western routes, the first being between the D'Entrecasteaux and Bampton Reefs, and eastward of the Solomon Islands, and the second westward of the Chesterfield Reefs and through Bougainville Strait. In following them little difficulty will be found, provided that when navigating between the reefs of the Coral Sea care be taken to guard against the effect of currents resulting from the prevailing wind.

Among the islands it is a dead beat from one group to the other in both seasons of the year in one direction, and a fair wind in the other, but beating against the trade presents the most difficulty owing to the choppy sea.

Sydney to the Solomon Islands—Full-powered route.—Direct, passing eastward of Frederick Reef, thence for the desired port.

Sailing routes—Northwest monsoon.—Stand to the northeastward to the one hundred and fifty-seventh meridian and thence to the northward, passing westward of Chesterfield Reefs, thence to the desired port.

Southeast trade.—Pass westward of Chesterfield Reefs and thence direct.

Solomon Islands to Sydney—Full-powered route.—Direct, passing eastward of Frederick Reef.

Sailing routes—Northwest monsoon.—Direct; the wind on the Australian coast southward of Sandy Cape being from the northeastward.

Southeast monsoon.—Make sufficient easting northward of latitude 15° S. to insure a long board across the Coral Sea; and keep along the coast when southward of Sandy Cape. The prevailing winds southward of Sandy Cape are westerly.

Sydney to Noumea and back—Full-powered route.—Direct, both seasons.

Sailing routes.—Pass between Lord Howe Island and Elizabeth Reef and thence direct. The passage in a sailing vessel is often a tedious one and is seldom made without encountering a gale.

The return route is direct, making the land to the northward of the port.

Sydney to the Caroline Islands—Full-powered route.—The route is direct through the Coral Sea and thence through Bougainville Strait.

Sailing routes—Northwest monsoon.—Pass between Lord Howe Island and Elizabeth Reef, thence northward between D'Entrecasteaux Reefs on the east and Bellona and Chesterfield Reefs on the west; thence between the Solomon and Santa Cruz Islands, crossing the Equator in about longitude 160° E.

Southeast trade.—Northeastward to the one hundred and fifty-seventh meridian, then north between Kenn and Bellona Reefs, eastward of Pocklington Reef; thence through Bougainville Strait, crossing the Equator in about longitude 153° E.

Caroline Islands to Sydney—Full-powered route.—The route is direct through Bougainville Strait and thence through the Coral Sea.

Sailing route—Northwest monsoon.—Make southing with the northeast trade and pass either through Bougainville Strait or eastward of the Solomon Islands, as convenient; thence to Sydney.

Southeast trade.—Make sufficient easting between the parallels of 4° and 8° N. to weather the Solomon Islands, and thence make a long board across the Coral Sea.

CURRENTS.

Central groups.—The principal ocean currents which are to be experienced among these groups are the equatorial and counter equatorial currents, the latter forming a broad band of water setting to the eastward at a rate varying from $\frac{1}{2}$ to 2 knots an hour, and is generally to be met with between the Equator and latitude 8° N.

Many authorities assign the limits of this easterly set between the parallels of 4° and 8° N., but several trustworthy observations have recorded it as running strongly to the eastward on and near the Equator; however, these limits must not be considered as settled, as they probably change considerably with the advance and recession of the trade winds.

The equatorial current in the Southern Hemisphere extends from the southern limit of the counter equatorial current as far as latitude 14° S., varying in strength from $\frac{1}{2}$ to 2 knots an hour; to the southward of this the westerly set becomes irregular and is much affected by the winds.

In October and November, 1880, the British surveying vessel *Alert*, employed searching for reported dangers between New Zealand and Fiji and Tonga Groups, in from latitude 22° S. to 29° S., experienced an easterly set, or against a strong southeast trade wind, of from $\frac{1}{8}$ to 1 knot per hour. A similar current was found in the British surveying vessel *Egeria* in the same locality in December, 1888. Observations of this set at other periods of the year are wanted.

In the northern part of the Marshall Group, northward of 8° N., the equatorial current will generally be found running to the westward at a rate of $1\frac{1}{2}$ miles an hour, though occasionally it is reversed, either by the winds or variation in the limit of the counter equatorial current.

A more detailed description of the currents among the several groups of islands is given under their respective headings, and will be found by means of the index, under the tide currents.

The currents in the New Guinea and Caroline Islands portion of the western Pacific have their origin in the equatorial current, which flows across the ocean between the parallels of 4° N. and 10° S., though westward of the meridian of 180° it is much affected by the prevailing monsoon.

Along the northeast coast of New Guinea and in the neighborhood of the Admiralty Islands it sets to the northwest, varying in velocity from $\frac{1}{2}$ to 2 knots an hour, except during the early months of the year, when it sets eastward along the coast of New Guinea; on the southeast coast and among the islands it becomes very irregular and to a large extent influenced by the prevailing wind. Owing to this

fact and to the great variety of local conditions affecting them, only brief and general remarks on the currents in the several groups can be given, and these will be found under their respective headings. All the available information has been collected and condensed on the current chart referred to in the text.

Caution.—Particular and constant attention must be paid to the currents when navigating among the island groups, for when near the islands they are sometimes deflected and always accelerated. Again, many of the islands are so low that it is often impossible to see them at night, and vessels may be driven on the encircling reefs without any warning from the lead, the reefs having in general very deep water close-to.

Current in barrier reef and atoll openings.—The tidal streams in such passages are generally very strong and can not be calculated upon to turn with high and low water. When a barrier reef is near the shore, a heavy swell will throw so much water over the reef as to cause a constant set out of the opening, and at times across the fairway; a knowledge of these facts should be borne in mind when navigating such localities.

Equatorial current and countercurrent.—The westerly equatorial drift in the South Pacific, caused by the southeast trades, will generally be found to extend from about latitude 20° or 25° S. to and considerably northward of the Equator, its further southern limit being toward the American side of the ocean. In the North Pacific that caused by the northeast trades extends toward the Equator from about latitude 25° N. on the eastern side to 20° N. as the Asiatic islands are neared. Near the equatorial limits of these currents, which correspond closely with the region of the Doldrums, the set is almost due west (true), but between them is the counter equatorial current setting in the opposite direction and sometimes with considerable strength.

Though the limit of the countercurrent is imperfectly defined, it appears to lie always northward of the Equator, generally between the parallels of latitude 4° and 9° N., more commonly between 5° and 8° N., though sometimes its influence has been felt almost down to the Equator and never exceeds 5° in width. It varies greatly in strength, running from $\frac{1}{2}$ to 2 knots an hour, and so far as is known varies also with the season, being stronger from May to October than during the other half of the year, when it sometimes appears to cease.

The British naval vessel *Challenger*, in March, 1875, experienced an easterly set between latitude 4° and 6° N., northwest of the Admiralty Islands. The lines of division between the equatorial and counterequatorial currents are sometimes distinctly marked, the

streams of the former being generally at their greatest strength when near these lines of division.

The equatorial current is very strong in places, the southern branch being as a rule the strongest; it has been recorded as attaining a velocity of more than 4 knots. In 1875 the British naval vessel *Challenger*, on her passage from Honolulu to Tahiti, experienced very strong currents and found the countercurrent farther northward than usual, the equatorial current only extending southward to latitude 11° N., with a general direction of S. 60° W., 18 miles per diem; its rate may, however, be anything between 12 and 40 miles per diem. From 11° to 6° N. the countercurrent was running to the eastward at an average rate of 30 miles per diem, but in latitude 7° N. its rate was 50 miles a day, and the temperature of the water was at its highest from 80° to 82° .

From 5° N. to 5° S. the southern equatorial current was running to the westward at an average rate of 43 miles a day, but in 1° N. its velocity was no less than 70 miles per day. In September to November, 1878, as much as 104 miles in one day was experienced in the British naval vessel *Opal*. Its temperature varied from 79° , being 77° at its axis of greatest rapidity. This extraordinary rate was also experienced by the French corvette *L'Eurydice* in the month of August, 1857, in $3^{\circ} 50'$ N.

In the North Pacific, on approaching the Asiatic side, the equatorial current turns off to the right and as the Kuro Siwo, or Japanese current, passes the Japanese Islands in a northeasterly direction; it then traverses the ocean toward Alaska and then flows along the western coast of North America to the southeast, finally rejoining the eastern part of the equatorial current, and thus completing the circuit. There is a notable subordinate eddy turning from right to left in the bay of Alaska; and a small cold southerly current from Kamchatka and from the Sea of Okhotsk toward Japan, but scarcely any perceptible supply of cold water enters the Pacific from the northward by way of Bering Strait.

The western part of the current down the American coast turns westward and northward in a wide circle northward of the Sandwich Islands and finally rejoins the northern, easterly, and southeasterly current across the ocean, thus completing a subsidiary circle of its own.

In the South Pacific, even within the region of the equatorial current, the stream among the island groups in the western half of the ocean is very irregular, and southward of them the water has a general tendency to flow off in some southerly direction. Eastward of the Tuamotu Archipelago, however, the southern part of the equatorial current appears to turn off to the southward, then

southeastward toward Magellan Strait; but the greater part turns eastward and northward up the coast of South America until it again rejoins the eastern part of the equatorial current, thus completing a circuit somewhat similar to that described in the North Pacific.

Currents in New Caledonia.—New Caledonia being nearly surrounded by a barrier reef, about leved with the water, with narrow openings, its shores and anchorages are not affected by the currents of the ocean, but by the periodic ebb and flow of tide only, the directions of which are known; it is not so with the currents encountered outside the great reef.

The south equatorial current of the Pacific, the direction of which is generally west, and its southern limit about the twenty-sixth parallel, is divided into two branches on nearing New Caledonia and Loyalty Islands. One branch called the Rossel current runs along the whole east side of New Caledonia (outside the reefs), from southeast to northwest, and its influence is most felt at a distance from the shore. After several days continuance of fresh southeast wind, the strength of the current is considerably increased, and a vessel capable of working to windward within the reefs would gain nothing to windward, if attempting to do so between the reefs and Loyalty Islands, and would also encounter a rough sea. With the wind at north or northwest the force of the current is diminished, or a countercurrent established between Loyalty Islands and New Caledonia, running to the southeast, and some days elapse after the cessation of the northerly wind before the northwest current reappears.

The second branch of the great current passes to the southward of the Isle of Pines, turns to the west and west-southwest and is deflected to the southward under the name of New Holland current, before reaching Australia. The west side of New Caledonia is thus screened and only feels feeble eddies, which are variable both in force and direction, being dependent on the wind and the action of one of the currents which pass the island.

The great southern reef which extends 30 miles from the shore, turns the second branch of current by opposing a powerful barrier; at the same time the streams of flood and ebb pass almost their full volume through the two passages, Havannah and Sarcelle; consequently the strongest and most irregular currents are found in those passages, while the space between the Isle of Pines and the southern reef is screened from the influence of the current. Vessels becalmed there at nightfall have only drifted 2 miles before daylight.

A more detailed description of the currents among the several groups of islands is given under their respective headings, and will be found by means of the index, under the title "Currents."

MISSIONS.

Missionaries or teachers are established on nearly all the inhabited islands of Polynesia and Melanesia, described in this volume, and the natives are friendly; caution, however, must be exercised in some of the New Hebrides.

The Melanesian Mission (Church of England) headquarters are at Norfolk Island, and operates in Melanesia, chiefly in the Solomon and Banks Islands. The New Hebrides are under care of the Presbyterian Mission from Victoria.

The central Pacific natives are chiefly Wesleyan and Congregationalists, mostly Wesleyan in Fiji and Tonga Islands; the Congregationalists have the eastern islands extending from Tahiti to Gilbert Group, including Tabuai and Samoa; they are connected with the London Missionary Society.

Westward of Gilbert Group all the islands north of the Equator are taken in hand by American Congregationalists connected with the Boston Board of Foreign Missions.

The Roman Catholics are scattered all over the Pacific; the headquarters are at Uea, or Wallis Island, where there is a cathedral, convent, and schools.

Telegraph.—There is a submarine telegraph cable between Queensland and New Caledonia, and land lines connecting it with all parts.

Natives.—The great Pacific basin has been divided for ethnological discussion into six portions, named, respectively, Australia and Tasmania; Malaysia, including the islands of the Malay Archipelago from Sumatra to the Moluccas and Philippines; Melanesia, including the chief islands inhabited by the black and wooly-haired race from New Guinea to Fiji; Polynesia, including all the larger islands of the central Pacific from the Sandwich Islands southward; Micronesia, comprising the small islands of the North Pacific; and, lastly, the New Zealand Group.

Shipwrecked persons need have no hesitation in landing at any place described in this book eastward of the New Hebrides, where they will be kindly treated and cared for.

Fish.—It is known that the fish caught among the reefs of New Caledonia are often poisonous; it is more so in Prony Bay than any other part. Many species which are good in Woodin Passage or in the open sea are poisonous in that bay.

TIDES.

The tides in the Pacific are complicated, partly produced by the local conditions existing throughout the numerous islands. Such observations as we are in possession of will be found in the descriptions of the several coasts and harbors.

The tidal undulation among the islands treated in this work is of small elevation, having a mean height of about 4 feet, and varying from 1 to 7 feet, and, though the observations are somewhat fragmentary, it would seem that the greatest range of the tide in this area depends greatly on the moon's parallax, so that the ordinary association attached to the definition of spring rise or neap rise, viz, that when the moon is new or full the highest tides occur and when it quarters the lowest high tides may be expected, does not hold good here.

The Hydrographic Office will be glad to receive tidal data relating to points covered by this work.

VIGIAS.

[A Vigia is a reported shoal the existence of which, or its exact locality, is doubtful.]

In no part of the world are there so many dangerous coral reefs and low islets arising abruptly from great depths, as in this portion of the world; in addition to which a vast number of *vigias* have from time to time been reported. Many of these have been disproved of late years by laborious search, but many are still on the charts, and until such have been clearly disproved must continue a source of constant anxiety and perplexity to the navigator of these seas. A great number of these reports are from whaling ships, and it is a common saying among whaling captains "that they do not care where their ship is so long as there are plenty of whales in sight"; thus doubtful navigation and strong currents account for a large proportion of *vigias* that encumber the charts of the Pacific Ocean.

It is here most earnestly urged upon those who may observe the appearance of a danger to obtain soundings from a boat if possible. The appearances of *vigias* sometimes caused by reflection from the clouds, by volcanic disturbance, and by marine animalculæ, resemble reefs and breakers so closely as to deceive the most experienced. A few examples are here appended.

The British surveying vessel *Alert*, 1880, reports on the subject of the numerous *vigias* reported in the South Pacific, "that whenever the surface of the sea becomes smooth '*confervoid algæ*' appear on the surface and form masses of discoloration very like the color of a coral reef some 3 fathoms below water. The officers of the *Alert* were occasionally deceived by these; also, when there is any meeting of currents of different temperatures shoals of fish often appear, and large fish splash and spout water so as to resemble breakers. I have little doubt that these are the principal sources of *vigia*."

The navigator of the British surveying vessel *Alert* states that on December 26, 1880, when searching for Le Rhin breakers, that "he saw what he felt confident were breakers, but upon examination it was merely large fish jumping and throwing the water high in the air; no bottom at 300 fathoms could be obtained at the spot." Also, during the run on the parallel of 24° 14' S., from longitude 176° 2' W. to 179° 18' W., we passed through dense fields of "*sea sawdust*" or "*confervæ*." Twice the ship was suddenly "hove to" in broad daylight in consequence of the appearance presented to a reef awash, but no bottom could be obtained at 300 fathoms.

At the Fiji Islands on two days in November, between 3 a. m. and sunrise, the sea worm, called by the natives "balolo," appears upon the coral reefs in great numbers. The Fijians esteem it a great delicacy. Upon its appearance (which is sudden) the natives muster in force to collect it. The Europeans longest resident in the group are unable to predict its appearance.

At the same time is given off a thick white scum, which floats away to sea in vast fields. These fields of scum are frequently mistaken for reefs, even by local traders who have experience. There appears little doubt but that many reefs reported near Fiji are nothing but this scum, or the *confervæ* so often seen by navigators of the Pacific Ocean.

The British surveying vessel *Egeria*, 1899, reports that much green water, having the appearance of shoals, was met with between Tongatabu and Falcon Island, but, on sounding in it, deep water was found, and the sea contained minute particles of volcanic matter. Doubtless many of the shoals formerly reported in the Tonga Group, and upon which no sounding has been obtained, are similar appearances to the above.

In July, 1888, when the *Egeria* was searching for Pelorus Reef and was about to slip a beacon on a bank which had been found, discolored water was reported from the masthead. This was almost immediately seen from the deck, and by 9 a. m. the beacon was dropped in 24 fathoms, with a stretch of light greenish water extending in a northerly and southerly direction for about $\frac{1}{2}$ mile.

Boats were lowered and remained all day in this green water, endeavoring to find a shoaler cast. Meantime more discolored water was reported from aloft. This being verified by an officer, Capt. Aldrich left the boats near the beacon and took the ship toward the discolored patch. After going 2 miles the small streak was seen from the poop of the vessel. It had remained as steadily as possible and had every appearance of being a very small shoal.

The ship was taken to within 100 yards of the discolored patch and a boat lowered to get a sounding on it; no bottom, however,

could be reached, so the ship was put in the middle of the patch and a sounding of 150 fathoms, no bottom, obtained. A bucket of this water was drawn and a bottle preserved, but there was nothing, apparently, to account for the light greenish color. It may be that the coloring matter was not actually on the surface. The fact remains that this small patch was sighted from aloft at very nearly 3 miles distant, and that even when within 100 yards of it it was believed to be shoal water, and that a sounding of 150 fathoms, no bottom, was actually obtained in the middle of the patch.

In this case it would appear probable that the discoloration was caused by organisms hatched on the bank, the matter floating away as above mentioned in the case of the "balolo."

The British naval vessel *Cormorant*, on passage from Malden Island to Penrhyn Island, observed what was thought to be a shoal about 4 miles distant. "It presented the appearance of waves breaking over rocks just under water. Lowered a boat to examine it. Shoal disappeared. I take it to be a shoal of bonitas, as since then we have had the same thing close alongside caused by fish."

In 1894 the British surveying vessel *Penguin*, searching for the *Ocean Ranger* Reef, reported to exist in latitude $18^{\circ} 44'$ S., longitude $157^{\circ} 2'$ E., discovered a bank of from 800 to 1,000 fathoms in depth situated between the parallels of $18^{\circ} 48'$ and $15^{\circ} 5'$ south latitude, and the meridians of $156^{\circ} 40'$ and $157^{\circ} 3'$ east longitude, and with depths of from 1,500 to 1,800 fathoms around, but no shallower soundings could be obtained.

During the search, and while obtaining a sounding of 1,713 fathoms, a considerable tide rip was observed, extending about 3 miles in a north-and-south direction from the ship, the ship herself being in the center of the rip, which might have been mistaken for breakers, and some such phenomenon probably was the origin of the report made by the master of the *Ocean Ranger*.

Doubtless many such tide rips and shoals of fish are reported as "breaking reefs." On every occasion of such things being observed a cast of the lead should be taken. This would render unnecessary a subsequent search for a danger which has no existence.

Definitions of Reefs.

Coral islands and reefs.—A large part of this work treats of coral structures under recognized names; a definition of each is here given.

An atoll may comprise one or any greater number of coral islands of little height above the sea, situated on a strip or ring of coral surrounding a central lagoon. The Ellice, Gilbert, and Marshall Islands are nearly all of this character.

Many of these atolls have passages through the ring of coral reef of sufficient depth to admit the passage of ships to secure and sheltered anchorage in the inclosed lagoon; but in some the passages merely admit boats, while in others the ring is perfect.

An atollon is applied to a small atoll on the margin of a large one.

A barrier reef may front a coast line or encircle an island or group of islands, leaving a deep channel between it and the shore. The Great Barrier Reef of Australia, which trends for about 1,000 miles in a northwesterly direction, varying in distance from 12 to 140 miles from the Queensland coast, is an example. These barrier reefs form natural breakwaters with passages through them into good harbors; these passes are generally opposite a valley in the land sheltered by the reef.

A fringing reef, as the name implies, is a coral reef extending from the shore, seldom for a long distance, having little water on it, and no ship passage between it and the land. As the seaward face of these reefs is generally higher than the other part of it, the tide is more or less impounded on some of them, facilitating navigation by canoes or boats at low water in the narrow passages which generally exist. It is frequently the case that a coast line having a fringing reef also has a barrier reef with a deep passage between these reefs.

Navigation among coral reefs.—As successful navigation through or among coral reefs is often dependent upon the eye, it is as well to name the conditions under which reefs are most easily seen. Thus, they are always more plainly to be seen from the mast-head than from the deck or bridge and when the sun is rather high than when it is low, as also when the sun is behind the observer rather than facing it. If the sea is glassy calm, it is extremely difficult to distinguish reefs.

The best conditions, therefore, are when the sun is high and behind the observer and the sea ruffled by a pleasant breeze. The banks with about 3 feet of water over them then appear of a light brownish color, those with a fathom or more of a clear green, deepening to a darker green as the water increases in depth, and finally to a deep blue when out of soundings.

Under favorable circumstances a bank with 3 or 4 fathoms over it can be seen from aloft at a good distance, but where and in proportion as the depths increase beyond this the bottom will only be seen when nearly over it.

The calendar or date line.—When crossing the Pacific Ocean either from eastward or westward, the date is usually altered when crossing the one hundred and eightieth meridian; the under-mentioned is a modification of this line to embrace certain groups of islands.

East of this line the date in the calendar is that of the American continent.

Westward of the line the date is Asiatic, or, so far as this volume is immediately concerned, that of Australia :

From lat. $60^{\circ} 0' S.$, long. $180^{\circ} 0'$, to lat. $51^{\circ} 30' S.$, long. $180^{\circ} 0'$.
 From lat. $51^{\circ} 30' S.$, long. $180^{\circ} 0'$, to lat. $45^{\circ} 30' S.$, long. $177^{\circ} 0' W.$.
 From lat. $45^{\circ} 30' S.$, long. $177^{\circ} 0' W.$, to lat. $15^{\circ} 30' S.$, long. $172^{\circ} 30' W.$.
 From lat. $15^{\circ} 30' S.$, long. $172^{\circ} 30' W.$, to lat. $5^{\circ} 0' S.$, long. $180^{\circ} 0' W.$.
 From lat. $5^{\circ} 0' S.$, long. $180^{\circ} 0' W.$, to lat. $24^{\circ} 0' N.$, long. $180^{\circ} 0' W.$.
 From lat. $24^{\circ} 0' N.$, long. $180^{\circ} 0' W.$, to lat. $28^{\circ} 0' N.$, long. $171^{\circ} 0' E.$.
 From lat. $28^{\circ} 0' N.$, long. $171^{\circ} 30' E.$, to lat. $31^{\circ} 0' N.$, long. $171^{\circ} 30' E.$.
 From lat. $31^{\circ} 0' N.$, long. $171^{\circ} 30' E.$, to lat. $35^{\circ} 0' N.$, long. $180^{\circ} 0' E.$.
 From lat. $35^{\circ} 0' N.$, long. $180^{\circ} 0' E.$, to lat. $48^{\circ} 0' N.$, long. $180^{\circ} 0' E.$.
 From lat. $48^{\circ} 0' N.$, long. $180^{\circ} 0' E.$, to lat. $52^{\circ} 30' N.$, long. $170^{\circ} 0' E.$.
 From lat. $52^{\circ} 30' N.$, long. $170^{\circ} 0' E.$, to lat. $65^{\circ} 0' N.$, long. $169^{\circ} 0' W.$.

Thence through the center of Bering Strait, and joining the one hundred and eightieth meridian in latitude $70^{\circ} N.$

CHAPTER II.

NEW CALEDONIA—INTRODUCTORY AND GENERAL REMARKS— SOUTHEAST PART.

New Caledonia—General navigation.—New Caledonia (a French possession) is the third island in point of size in the South Pacific, being inferior in this respect only to New Zealand and New Guinea. It is about 290 miles long and about 43 miles broad across the reefs at the south end, diminishing to 30 miles at the north end.

The standard time kept throughout New Caledonia is 11 hours east of Greenwich.

The following general rule is applicable to all vessels when using any of the passages through the outer reef, but especially sailing ships of dull sailing qualities or weakly manned—with a beam wind they should always enter on the weather side as much as possible, and carry as much sail as the weather and other circumstances will admit, in order to keep the ship under command, being at all times on guard against the effect of variable winds, strong flood or ebb tide, the consequent eddies and chopping sea. Those under full power find less difficulty.

Those about to undertake the inner navigation round any part of the island should remember that in such reef-strewn waters the number of hidden dangers is so great that some hitherto unknown will occasionally be discovered; it is therefore necessary to keep a very good lookout from the masthead. With the exception of some of the bays and opposite the mouth of large rivers where the water is discolored, rocky patches that are covered by about 4 fathoms can be seen at a distance of 1 mile from an elevation of 80 or 100 feet; when close the bottom can be seen in 10 fathoms at least. When there are passing clouds, the effect of the light and shade on the water may be mistaken for the indication of a shoal, but the change of form and movement of a mere shade will soon become apparent. To have the sun ahead and at an altitude less than 65° is the worst circumstance attending the navigation among the shoals.

When navigating within the great reef, without a trustworthy pilot, or in unsettled weather, it will be prudent to make sure of a convenient anchorage or to stand out to sea, through one of the pas-

sages, before nightfall. The general depth between the great reef and the land varies from 50 to 20 fathoms; it is nearly all hard rock or broken coral; sometimes the ordinary lead will bring up mud, but the sounding machine shows that there is but a thin receptive covering of mud upon hard rock. Though many vessels have anchored between the great reef and the island without accident, it must be considered a dangerous thing to do, especially on account of the liability to a rapid change in wind and weather. There are also the usual dangers attending an anchor on rocky ground.

On neither side of the island do the reefs give shelter from the sea during northwest or southeast winds—that is, in the direction of the channel—but, on the contrary, they render the waves short, hollow, and disagreeable. The inner channel on the west side of the island is sheltered from the sea coming from southwest, because the reef is generally on a level with the water; it is not so on the east side, where the surrounding reef is sunk in many places and therefore gives no protection against a northeast sea. Outside the reefs which surround New Caledonia the sea has justly acquired a very bad reputation for being hollow and confused, especially in the channel formed by the Loyalty Islands.

The sea within the reef becomes rough directly a stormy breeze sets in, and it is equally quick in subsiding. The part of the island where the heaviest sea has been observed is round the Nokanhui Reefs, to the southeast of the Isle of Pines. During strong squalls from southwest during flood tide the waves break into foam at a considerable height on those reefs.

Local navigation—Puebo to Noumea.—A sailing vessel wishing to make the passage quickly has the choice of two tracks—by the south and the Havannah Passage or by the north, which appears the more advantageous. The distance is nearly the same, but by passing round the north end of the island and leaving the great reefs by Pume or Gazelle Passage (on the northwest side) the strong current and heavy sea will not be encountered while running along the reefs on the west side, as would be found in the channel between New Caledonia and Loyalty Islands; also while within the reefs smooth water will be insured, with ample space to make long boards till sufficiently to windward to go out by one of the passages.

During the bad weather season a vessel would be better situated and more under command when to the westward of the island in case of being surprised by a hurricane. A vessel under steam during strong southeast winds will always find an advantage in passing to the northward and steaming up on the west side of the island inside the reefs as far as Kumak Passage. The inner track thence to Duroc Passage is intricate and in some parts shallow.

Telegraph stations.—There are telegraph stations at Noumea, Burai, Gomen, Kanala, Pam, Puembut, Yengen, St. Vincent, Uegoa, Prony Nepui, Kuaua, and Kumak.

Uniform system of buoyage (relating to colors only) has been adopted on the coast of New Caledonia.

Proceeding from the entrance of Bulari Passages to Noumea, all buoys and beacons painted red should be left on the starboard hand and those painted black on the port hand.

Proceeding northward from Noumea to Paaba (north end of New Caledonia) along the west coast, all buoys or beacons painted red should be left on the starboard hand, or landward, and those painted black on the port hand, or seaward.

Proceeding from Noumea round the south end of New Caledonia and along the east coast to the northward, all buoys and beacons painted red should be left on the starboard hand, or seaward, and those painted black on the port hand, or landward.

Isolated dangers which may be passed on either side are marked by buoys painted red and black in horizontal stripes.

Hurricanes.—During the whole of the wet season, but principally in January and February, New Caledonia is exposed to hurricanes. In March, 1890, a very violent hurricane swept over the northern part of New Caledonia and did great damage to agriculture and shipping. They are, in some instances, preceded by cloudy, gloomy weather and oppressive heat, their approach being only indicated by the falling barometer a few hours previous. In general, however, after some days of squally weather, accompanied by abundant rain, with a sky uniformly gray, or still more sure if the sky be crossed by banks of copper-colored clouds and the barometer standing about 29.50, a hurricane may be expected. The diameters of these cyclones are generally of small extent, as those which cross the center of the island are not always felt at the extremities; their rotation is, according to the law of storms in the southern hemisphere, with the hands of a watch, and their lateral movement in the southern part varies from the southwest to southeast. All parts of the island are subject to these cyclones.

The great extent of elevated land in New Caledonia often modifies the direction which these storms might otherwise take. In general, when the passage of the center encounters the land at the northern part it is deflected according to the trend of the island and advances from northwest toward southeast.

If a vessel should be outside the reefs of this island when indications of an approaching hurricane are observed, the navigators should decide immediately either to enter one of the passages and attain a safe anchorage within the reef, if it could be done before the arrival

of the hurricane, or take at once the course which will most quickly secure an offing.

Should a vessel be outside the girdle of reefs on the west side, she should make to the southward and stand far enough in that direction to be perfectly free from the reefs off the south end. It is also supposed that hurricanes rarely pass to the southward of the Isle of Pines.

The position of a vessel would be somewhat critical if overtaken by a hurricane while in the passage between New Caledonia and the Loyalty Islands.

On the east coast, during the daytime, with an easterly wind or under steam, there should be no hesitation in regard to running for one of the protected anchorages, such as Proni Bay, Port Bouquet, Kanala, Kuaua, or Pam Bays. With a westerly or southwesterly wind a sailing ship would be obliged to run to the southward past the Loyalty Islands and then to the southeast; passing as far as possible from the position assigned to Durand Reef; after which she can follow the generally known rules for avoiding the center of the storm.

If during the night a sailing ship should be taken by surprise by an approaching hurricane when between the Loyalty Islands and New Caledonia, with the wind from northeast backing to north and north-northwest, she should run with the wind on the port quarter, pass close southward of Ile Mare and thence southeast till beyond the parallel of the Isle of Pines, then heave to on the port tack—she would be in the dangerous semicircle.

If after passing the Isle of Pines the wind should blow steadily from northeast, with a continuously falling barometer, it will probably be safest to run south-southwest and when the barometer begins to rise heave to on the starboard tack.

If, when in the above position, the northeast wind veers to east-northeast and east, it will be necessary to put the ship quickly on the starboard tack and to pass as close as possible to the Loyalty Islands, in order to run ultimately to the northwest when the wind has veered to east-southeast. This is the least dangerous semicircle.

Islands and Reefs Eastward of New Caledonia.

Hunter Island was discovered in 1798. It is a volcanic block 974 feet high, 1,000 yards long north and south, by 670 yards broad. Its abrupt slopes are grassy with but few trees, and though jets of sulphurous vapor issue therefrom, it is not in other respects active as a volcano.

There are depths of 40 fathoms with 100 yards of it, and 500 fathoms, black sand, within 1 mile. There are no known outlying dangers, but from its northwest side overfalls extend to a distance of 2 miles. The island is in latitude $22^{\circ} 24' S.$, longitude $172^{\circ} 05' E.$

If landing be possible under favorable circumstances, it would be on the north or northwest side, under the lee of some rocks. The island is uninhabited.

Matthew Island was discovered in 1788. It is small in extent, 465 feet high, and is in latitude $22^{\circ} 20' S.$, longitude $171^{\circ} 20' E.$

It is a cone rising from a triangular base, each side occupying about 670 yards. It is of volcanic formation, composed principally of basaltic rock; being arid and uninhabited it serves as a refuge for numerous sea fowl. The shores are free from known danger, and anchorage will be found off the west side in 27 to 32 fathoms, on fine sand, at less than $\frac{1}{4}$ mile from the shore.

Current.—Off the northwest and southwest points strong westerly currents were found, which on uniting about $\frac{1}{2}$ mile from the west side of the island formed violent eddies.

Walpole Island.—This island was discovered in November, 1794. It is rather more than 2 miles in length north and south, and about 1 mile wide; it is formed of fossil coral and presents the appearance of a narrow table, the vertical walls rising about 300 feet at the north end. From the southward the upper part appeared to be one united mass, with no other vegetation visible than a few stunted plants.

Landing can be effected on the west side with difficulty at about $\frac{1}{2}$ mile south of Perforated Point.

The island is frequented by many seabirds, chiefly black gannets.

L'Orne or O'Neill Bank.—In August, 1874, the French transport *L'Orne* passed over a bank lying 10 or 12 miles to the northward of Walpole Island. At daybreak the bottom was seen and the lead gave 13 fathoms, sand and gravel, in latitude $22^{\circ} 26' S.$, longitude $168^{\circ} 56' E.$ The ship was going 2 knots or less, with the wind aft, the sea nearly smooth, but the waves were a little hollow as usual over banks. Patches of discolored water could be seen at a considerable distance round the ship; sounding was continued during a run of 3 miles 89° , in which space the depth increased regularly from 12 to 16 fathoms; then, suddenly, no bottom could be found with 98 fathoms of line and the water regained its dark-blue color.

In 1876 the French ship of war *le Curieux* sent a boat to sound the bank, when the least water found was $5\frac{1}{2}$ fathoms in latitude $22^{\circ} 24' S.$, longitude $168^{\circ} 56' E.$ Vessels should not pass over the bank, as a moderately heavy sea would break on it. In 1906 a steamer passed slowly across the bank on a 174° course for 2 to 3 miles, obtaining depths of 19 to 14 fathoms and then no bottom at 28 fathoms. The 14 fathoms was obtained in latitude $22^{\circ} 26' 00'' S.$, longitude $168^{\circ} 59' 30'' E.$, with two extremes of Walpole Island, 200° and 204° .

At about 12 miles 75° from l'Orne Bank a depth of 7 fathoms was obtained in 1877. This position has been passed over three times without any discolored water being seen.

Durand Reef.—In November, 1794, Capt. Butler in the ship *Walpole* discovered a reef, which has since been examined by Capt. Denham, who placed it in latitude 22° 02' 30'' S. and longitude 168° 39' 30'' E. Capt. Denham described it as about 1,300 yards in diameter with a depth of 1½ fathoms. This reef is particularly dangerous because the sea does not always break on it and the lead gives no warning of its proximity.

Torch or Nautilus Bank.—In 1854 the British naval vessel *Torch* discovered this bank and placed it 134°, distant 17 miles from Nga Peak on the Isle of Pines. The least water found on the bank was 20 fathoms, but there may be less.

Reefs Westward of New Caledonia.

Fairway Reef, thus named from its lying in the fairway between Australia and New Caledonia, midway between the Bellona Shoals and New Caledonia. It is coral, is about 1½ miles in circumference, and awash at or before low water.

This reef is the center of a bank about 9 miles in diameter, in depths less than 100 fathoms. There is a fairly level bank of from 10 to 16 fathoms, coral sand, off the western side of the reef, about ¼ mile wide.

Breakers have been reported (1911) 50 miles eastward of Fairway Reef.

Darling Reef.—The master of the *Lady Darling* reported, in January, 1879, in latitude 20° 22' S. and longitude 162° 20' E., passing over the tail of a reef about 1 mile in extent east and west; he obtained no soundings, but judged the depth to be from 4 to 5 fathoms.

In 1884 Darling Reef was unsuccessfully searched for by the French Government vessel *D'Estes*. In 1882 the British surveying schooner *Lark* passed over the assigned position without any danger being seen.

An officer of the bark *Bertha* reports having passed over the Darling Reef in latitude 20° 37' S. longitude 162° 26' E. (about 16 miles from the above position). The reef was estimated to be about 300 yards wide. The vessel was drawing 22 feet, and did not touch it; soundings were not taken.

NEW CALEDONIA.

The Isle of Pines, or Kunie, the principal southeastern island in connection with New Caledonia, is level with the exception of one peak; it is 11½ miles long northeast and southwest, including Kutomo

or Lesser Isle of Pines, cut off from the principal part by a narrow channel. The general shape of the island will be better understood by the chart than by description. Near the beach the coast is generally low and stony, with very little earth fit for cultivation, but thickly covered with bushes; at 2 miles from the shore the soil improves, and on the north side, as far as the center of the island, it rises gently and has a few trees. The land is of richer quality on the central plain, which rises gradually toward Nga Peak, which is on the southwest side of the island. The peak is conical, and 880 feet high, thickly covered with trees to the summit; when seen from the southwest it appears double.

To the southeast of Kutomo (Lesser Isle of Pines) the reef Nokan-hui, which is $3\frac{1}{2}$ miles in length and $2\frac{1}{2}$ miles wide, incloses a lagoon.

Directions—Noumea to Isle of Pines.—A sailing vessel bound from Noumea to the Isle of Pines during the prevailing southeast wind would experience difficulty in following the track shown on the charts, and would perform the voyage quicker outside the reefs, going out by Dumbea or Bulari Passage, and working to windward till able to round the southern part of the reefs of New Caledonia, and then steer for either end of the Isle of Pines, according to her destination. There would be no difficulty in a steamer, with local knowledge, proceeding by the inshore and smooth-water route.

Sailing vessels may also work through the Woodin Passage, anchoring in the channel (if necessary) during the night and proceeding in the morning by way of Havannah Passage, to work up in the open sea outside the chain of reefs which lie between the great island and the Isle of Pines. Those two are the only tracks possible for a large sailing vessel during the southeast wind; it would be impossible for any such vessel to work to the southward through the middle of the rocks.

Vessels would have a fair wind in proceeding in the opposite direction.

Vessels from the eastward, bound to Noumea, should use the Havannah Passage.

Kuto Bay.—This bay, situated on the southwest side of the Isle of Pines, is the usual place visited by vessels having business with the convict establishment.

Rocks.—A beacon formed by an iron perch surmounted by a spherical cage stands on the north side of the reef attached to Kuto Peninsula. Off the northwest end of that small peninsula there is a rocky pinnacle, with $2\frac{3}{4}$ fathoms water, a little over 400 yards 257° from the beacon. In the vicinity of that rock there are two other blocks of coral with only 2 fathoms over them at low water. Also at 900 yards 303° from the northwest end of Kuto, directly in the

fairway, there is a $3\frac{1}{4}$ -fathom patch, with depths of 5 to 6 fathoms close round it.

A small rock with $1\frac{1}{2}$ fathoms water and 9 to 10 fathoms round it lies in the fairway of the channel southeastward of Bayonnaise Island, with the south extreme of Kuto Peninsula bearing 63° , distant 1,200 yards.

Anchorage.—The space available for anchorage is only about 400 yards wide between the reefs; moderate-sized vessels should not advance farther than to have the west end of Kuto Peninsula bearing 179° when the anchorage will be in 5 fathoms. Small vessels may bring the same point to bear 224° , or make fast to a mooring buoy in the southeast part of the bay. Even small vessels should not go into shallow water near the beach, as during westerly winds the surf is heavy.

Directions.—Many passages lead to Kuto Bay and many shoals border the fairways. Steamers will find a clear channel between Kue Reef and Nokue, thence northward of Bayonnaise, avoiding the charted dangers. The recommended routes are shown by a dotted line on the chart.

A sailing vessel from the south or east would choose either the Alcmene or Nokue Passages, through the clear spaces shown on the chart. Steamers from Noumea, after clearing Woodin Passage and Ugo Islet, follow the track indicated on the chart.

Nokue Passage.—A sailing vessel bound to Kuto Bay would not have the advantage of laying through with the wind at east; in which case she should take the Alcmené Passage, though it has numerous heads of coral near the track. From the southward, to reach Kuto by the Nokue Passage, Moro Islet should be brought to bear 10° and the vessel run in that direction till Nga Peak appears open north of Kuto Peninsula, when the course may be directed for the bay.

Kuto Bay may also be reached through Nokue Passage by steering for the center of Bayonnaise Island, when bearing 44° till within $\frac{1}{2}$ mile of it, then rounding it on either side, guarding against the shoal 400 yards off the east end, and also that in its fairway.

Alcmene Passage.—When running through this passage it is more than usually necessary to have a good lookout from the mast-head, as there are so many heads of coral standing up from deep water. The leading mark is in Nga Peak showing over the east side of Duroc Islet bearing 20° ; but it passes over one patch of 6 fathoms.

When the west side of Kuto Peninsula bears 314° course may be shaped to pass westward of it, and thence to Kuto Bay.

Or, if proceeding to Port Vao, with the Kuto Peninsula bearing as above, steer eastward on the dotted line shown.

If proceeding to Alcmene anchorage, when the west extreme of Alcmene Island bears 134° , alter course to 86° , passing northward of the dangers, as shown by the dotted line.

Kanumera Cove, on the east side of Kuto Peninsula, affords good shelter for small vessels.

Caution.—The anchorages at Alcmene and Vao are not very secure, except with winds from the eastern half of the circle; they are open to winds from west and southwest, which are often violent and raise a high sea. Also, the communication with the shore from those anchorages is often difficult, and the tidal streams are strong.

Nokanhui Passage is between the Lesser Isle of Pines (Kutomo) and Nokanhui Reef and the width at the narrowest part is 1,350 yards and the depth apparently not less than 6 fathoms. The tidal streams generally flow through it at a very moderate rate, but with the flood running to the westward during southwest winds the sea is agitated. When the southeast wind is established there is no swell, but the stream is so strong that it requires a stiff breeze to enable a sailing vessel to stem it. On that account the passage is not recommended for small vessels, or steamers with small power.

Ugo Bay.—This little bay, situated on the northeast side of the Isle of Pines, is not protected on the north side and can only be used by small vessels as a temporary anchorage. It will be found by bringing Nga Peak to bear 230° .

Gadji anchorage, on the north side of the Isle of Pines, may be reached by either of two passages. Upe Passage, the eastern entrance, may be approached with Nga Peak bearing 192° , and seen a little to the right of a small beach at Upe; when inside and clear of the reef which forms the north side of the passage, steer 257° and anchor $\frac{1}{2}$ mile from the shore in $16\frac{1}{2}$ to 19 fathoms; bottom, sand and coral, moderately good holding ground.

Gadji Passage at the northwest end of the inclosing reef may be entered by running for Nga Peak bearing 165° till Gie Islet bears 269° , then the course should be 117° to the anchorage.

Uamæo Bay.—This large bay on the northwest side of the Isle of Pines is accessible by two passages from the northwestward; that westward of Buombui Reef is free from danger, as the reefs are easily seen; the leading mark is Nga Peak bearing nearly 155° .

The passage farther to leeward is 1 mile wide, and lies westward of Tiare Reef. Nga Peak bearing 148° will lead through it direct for the anchorage and to Numæ Rock, which lies just within the 5-fathom line. Vessels should anchor short of it unless bound to

Uamæo village, when they should pass 400 yards westward of the rock.

A sailing vessel may work through the leeward passage into Uamæo Bay, the prevailing wind rendering the patches of rock, which are near the track, very apparent.

Anchorage may be taken according to the draft of water. There is a watering place at Uamæo.

South Reef—Passages.—The point of the barrier lies some 40 miles southward of the southeast extreme of New Caledonia, and it is known as South Reef. A passage is shown on the charts at its extreme, with 6 fathoms water, but it has not been sufficiently examined to justify the attempt to enter, and nothing would be gained by doing so, or by using the three following passages, if bound to Noumea:

Kuare Passage is the first practical passage of which anything is known when advancing from the southwest (lat. $22^{\circ} 47' 15''$ S.); when Ia Peak can be distinguished bearing 359° , it will lead to the entrance between Neokui and Neokumbi Reefs. After clearing the ends of the reefs, which form the passage, the course will be toward Mount d'Or, while bearing 345° ; but that track leads very close to a reef which lies on the starboard or eastern side about $9\frac{1}{2}$ miles from the passage; thence as from Mato Passage below.

Uatio Passage.—This passage (lat. $22^{\circ} 44'$ S.) is about 4 miles northwest of Kuare Passage and is far preferable. Mato Islet bearing 24° will lead to the entrance of Uatio Passage. During southeast winds a sailing ship would range close around the end of Neokumbi Reef on the weather side while guarding against the set of the tide, especially during flood. After clearing the passage the course should be northeasterly till Mount d'Or bears 345° when the course will be toward that summit on the same bearing; thence as from Mato Passage below.

Mato Islet and Passage.—Mato Islet is situated 5 miles southward of Uen Island and $12\frac{1}{2}$ miles northeastward from the passage which bears its name; it is high and conical, therefore should not be mistaken from seaward for one of the bushy islets about that part. From outside the reefs Uen Island, Ia Peak, and the lighthouse on Amedee may be distinguished and by them the position of the vessel relatively to the passage may be determined. Uen Island may be known by its dark color standing out in contrast with the higher mountains behind and to the northward. The summits of Mu, Kogi, d'Or, and Ia are visible beyond 50 miles in clear weather, but they are often covered with clouds.

Mato Islet, bearing 47° , is the leading mark for the passage. When $2\frac{1}{2}$ miles within the reefs on the above bearing, alter course to

the northward to bring Mount d'Or 345° , as from the before-mentioned passages, and steer for it, passing between the wooded islet Redika and the large reef U till the south end of Uen Island bears 89° , when the course will be toward Ndoi summit, which stands on the southern part of Noumea Peninsula. That last track will be between the Four Northern Banks on the port side and on the starboard side Tareti Islet, the small banks Nakae and Kae, also Provident Shoal, which is marked by a buoy.

This passage is very seldom used, and those farther to the southeast still less.

Sarcelle (Teal) Passage.—This is the first passage of any importance through the southeast reefs northwestward of the Isle of Pines, being 12 miles from that island and 14 miles from the high land about Cape Queen Charlotte. It is 2 miles wide and free from any known danger, except near the north point of the entrance. The position may be recognized at a distance by Ietendi Rock, which stands on the reef on the north side 10 feet high. This passage is traversed by tidal streams nearly as strong as those in Havannah Passage, and is equally subject to eddies and a hollow curling sea.

Directions.—The face of the reef on the northwest side extends $5\frac{1}{2}$ miles southwestward. On rounding the inner angle of that reef at a short distance the course is toward Nuare, a low wooded islet lying 7 miles west-northwestward from the southwest angle of the reef, following the track given on the chart.

Amere or Cook anchorage.—This space, inclosed by reefs in nearly every direction, is about 2 miles north and south and 3 miles east and west. It is separated from Sarcelle Passage on the south by two extensive reefs. It may afford a temporary anchorage, but the general depth is over 30 fathoms, and the shelter would be very precarious in bad weather.

Havannah Passage is that generally used by vessels from the northward and eastward proceeding to Noumea. It has leading lights on Cape Ndua, about 8 miles within the entrance, and the principal dangers near the fairway are buoyed, as herein described.

The entrance is nearly 2 miles wide between the Goro Reefs off Cape Queen Charlotte and the Komekame Reefs. Cape Ndua, the southernmost part of New Caledonia, is high, prominent, and, being of a remarkable reddish color, is the principal landmark during daylight for the navigation of Havannah Passage.

The leading mark, Mount Nogunguelo, 860 feet high, on Uen Island, just open of Cape Ndua, 246° , or the leading lights in line 247° , lead through the entrance.

Cape Ndua lights.—Two fixed white lights are situated on Cape Ndua. The high light is at an elevation of 620 feet above high

water, and is visible 8 miles. It is shown from a stone block 6 feet high, erected on the summit. It is fairly conspicuous, being backed by a white wooden framework and white cairn. Approaching from the northward, it is obscured until on a 220° bearing, and again between the bearings of 225° and 229° by a hill.

The low light is at an elevation of 374 feet, and is visible 5 miles between the bearings of 233° through west to 305° . It is shown from a stone block 3 feet high, at a distance of 600 yards 67° from the high light. The structure is not easily seen by day.

These two lights in line 247° lead through the western part of the Havannah passage.

After passing Ioro Reef from the eastward the high light is obscured. It is intended to exhibit a red sector of 5° from the high light over the Prony Reef.

Signal station.—An international code signal station, connected by telegraph with Noumea, has been established on the above cape.

Shoals near the fairway.—**Coetlogon Bank**, on the north side of the entrance, has two heads with $5\frac{1}{2}$ fathoms water over them 2,400 yards apart, the southernmost of which lies 4 miles 98° from the south end of Nau Island. A good lookout from the masthead is at all times necessary as there may be other patches undiscovered. The clearness of the water at this part will allow the bottom to be seen at a sufficient distance.

Vandegu and Kie Banks are both dangerous; the first is on the north side of the entrance, with a least depth of $4\frac{1}{2}$ fathoms on its south and situated about 1,200 yards southeast of the Goro Reef, the sea generally breaks on it. The Kie Banks lie southward of the fairway and are about 1 mile apart; the outer one has a least depth of 3 feet, and is situated $1\frac{1}{2}$ miles 188° of the Vandegu. They are not always marked by breakers, though the outer head is so shallow; the inner head has 10 feet water over it.

Ionontea and Chambeyron Banks, having, respectively, 3 feet and $2\frac{1}{2}$ fathoms over them, are only in the way of vessels working in or otherwise out of the direct track, being far to the southward.

Ioro Reef is awash at low water; the northeast end of it lies 2 miles 67° from Cape Ndua. It is easily distinguished and may be passed on either side. The flood tide is stronger on the north side of the reef than the south and the reverse during the ebb.

Hydrography Shoal, which is covered by $2\frac{1}{2}$ fathoms, lies nearly 2 miles 210° from Cape Ndua, south side of the fairway; it is marked by a red and black conical buoy with a reversed-cone top mark. The track is to the northward of that shoal, with Ia Peak open to the northward of Uen Island 285° .

Prony Reef extends under water about $\frac{1}{2}$ mile southwest of the west point of the peninsula of which Cape Ndua is the southernmost

elbow; it forms the south side of the entrance to Good Cove and Prony Bay. The extremity of the reef is marked by a beacon.

About halfway between the beacon on the end of Prony Reef and the steep termination of Cape Ndua there is a rock at a short distance offshore with 1 fathom over it.

Moziman Shoal is at the north side of the eastern entrance to Woodin Passage and on the west side of the entrance to Prony Bay; it has 3 feet over it and was formerly marked by a black conical buoy with a reversed-cone top mark. The buoy is reported to be withdrawn, 1908; the shoal, therefore, is a danger.

Tides and tidal streams.—It is high water, full and change, in Havannah Passage at 8h. 30m. Both flood (to southwest) and ebb (to northeast) sometimes attain the rate of 5 knots an hour through the channel; and about the time of change of tide there are violent eddies requiring great care in the navigation.

Directions.—Havannah Passage should be approached and entered with Mount Nogunguelo on Uen Island just open of the foot of Cape Ndua bearing 246° , which leads between Vandegu and Kie Banks, allowing for the strong tidal stream that may be met with. Approaching Ioro Reef, steer with the light structures on Cape Ndua in line, or with the high one 247° , which leads northward of that Reef. Thence round the cape at a prudent distance and shape course to pass southward of Prony Reef Beacon and Moziman Shoal for Woodin Passage.

At night steer for the high light on Cape Ndua, bearing 247° , which leads through the entrance, and when the low light is seen keep the lights in line on the same bearing until close to the front light, when the cape should be rounded at a prudent distance.

To proceed farther westward with safety must depend on the judgment of the navigator until further lights are established. Grand Port in Prony Bay could be entered without much difficulty.

Directions continued on subsequent page.

There is a channel northward of Vandegu Bank, between it and Goro Reef, where the tidal streams and eddies have less strength; with the south extremity of Cape Ndua bearing 239° , nearly in a line with the southeast hill of Uen Island; it also leads northward of Ioro Reef, thence proceeding as before. An experienced eye at the mast-head will probably be a better guide. The least depth on the bank is $4\frac{1}{2}$ fathoms and there would not be less water on the line indicated. It is recommended, however, to enter by the main channel.

Sailing vessels proceeding eastward through Havannah Passage during the ebb tide working against a northeast wind, and after the tidal eddies have commenced, should go on the starboard tack directly after crossing to the southeast side of the mid-channel track, as the eddies sometimes run violently to the southward and southeast in the

vicinity of the Kie Banks, and the state of the sea might prevent their tacking.

There are strong tidal streams in Havannah Passage, as before stated. It is much used by coasting vessels and others from the eastward, but several wrecks have occurred on Komekame Reef.

No anchorage.—Anchorage should not be taken in the passage under any circumstances, as the bottom is hard rock, which would not assist to hold a vessel in position even during a calm. If there be a fear of not reaching Prony Bay or Uen Island in the tide, it will be better to run into Wooded Port or Port Goro for the night than to remain at sea in the offing, especially during the bad-weather season and spring tides, as under those conditions many days might be lost by a sailing vessel, either by a change in the weather or by being carried too far away by the current. A land breeze will generally be found between 5 and 7 a. m. which would take a vessel out of either of those small ports.

Port Goro.—This is the first anchorage on the south end of New Caledonia after entering Havannah Passage. It may be entered on either side of Center Reef. The eastern entrance is Goro Passage and the western Tæmo Passage. An allowance must be made for the tide when running for this port and a careful lookout for the rocks kept from aloft. The outer part of the sea reef is not steep-to, nor are either of the reefs on their inner sides. Tæmo Islet, standing about 400 yards from the west end of the middle reef, is small, low, and has trees upon it; Sand Island is bare. Dome Point is a salient headland, with a flat top. Middle Bank, near the center of the harbor has 4 or 5 feet water, and there are patches north and east of it. All the northeast part is shallow and rocky; the deepest water is found along the coast.

Directions.—Entering by Goro Passage, when, by the aid of a good lookout from the masthead, Center Reef has been passed, the anchor should be let go in 8 to 10 fathoms when Tæmo Islet bears 224° , sandy bottom. Should there be a fear of bad weather during the night, rendering thoroughly good holding ground desirable, the course, after passing through Goro Passage, should be shaped toward Dome Point, and when it is within 400 yards steer northward along shore until northward of Middle Bank about 800 yards, when the anchor may be dropped in 10 fathoms, soft mud, secure from the most violent winds. If Middle Bank can be distinguished, it will be easy to steer midway between it and Dome Point and thence to the desired position.

Tidal streams.—Port Goro is subject to continual streams of tide, but not so strong as in the entrances. The ebb stream comes through Tæmo Passage and goes out to the northward; a part runs along the

coast to Kuebuni Passage. The flood runs in the reverse direction, except that during the first three hours it also runs along the coast to the northward.

Supplies.—Excellent water may be procured from a rivulet on the north side of Dome Point, and at the foot of the same hill some small fir trees are suitable for firewood.

Port Kue lies westward of Port Goro.

Wooded Port (Port Boise).—This small harbor is 5 miles within Havannah Passage; it is perfectly inclosed and the bottom is good holding ground. The points of the reef at the narrow entrance extend a short distance under water. The anchor may be dropped near the center of the harbor in 14 to 16 fathoms, muddy bottom.

Prony Bay, north side of Havannah Passage, offers ample space of open water and good holding ground, but the depth is generally great for anchorage. In ordinary weather and wind from east-southeast those desirous of stopping the night only may safely anchor inside East Point, close to the shore, avoiding Prony Reef off the point, in 10 or 11 fathoms, but a better position will be found in East Roadstead (Good Cove), in about 20 fathoms, as shown on the plan. In less water the holding ground is bad.

Prony Reef on the east and Moziman Shoal on the west side of the entrance to Prony Bay have been described before. Aiguille Rock at the northwest part of the bay, between the Great Roadstead and Sebert Cove, lies in the fairway covered by 1 fathom water only and is marked by a buoy.

Telegraph.—There is a telegraph station at Prony.

Sebert Cove.—This narrow, well-sheltered cove at the northwest extremity of Prony Bay was formerly used by vessels requiring wood and water, but it is now becoming of more importance.

Directions.—Vessels approaching Sebert Cove or Bay should do so on the bearing 323° , which will lead in 6 fathoms in mid-channel between Casy Island and Green Bluff and about 200 yards westward of Aiguille Rock Beacon. When northward of it steer as requisite to the desired anchorage.

Water.—Excellent fresh water may be obtained at the inner part of Sebert Cove.

Fish.—Many species of fish in this bay are poisonous, to a much greater extent than at other places within the reefs.



CHAPTER III.

NEW CALEDONIA—UEN ISLAND TO NOUMEA (INNER ROUTE).

Havannah Passage to Noumea.—Uen Island lies off the southern point of New Caledonia. It presents in all parts a ferruginous, uneven surface, absolutely sterile with the exception of some narrow strips at Kuture, at Port Kute, and at the mouths of some of the small streams. The land at the back of Port Kute is considerably lower than the rest of the island, hence it results that when viewed from a distance, either eastward or westward, it appears like two islands.

Uara Bay, on the east side of Uen Island, is formed by the Ma Reef and the coast reef; in the center of that space there is good anchorage in 19 fathoms; the northern entrance is the better, but a small vessel may enter from the south. If from Port Kute or Kumbe Cove, they should leave on the port side the two small reefs situated near the east side of Kumbe Reef; then run along the east side of Kue Reef, which lies southwest of Ma Reef.

Port Kute and Kumbe Cove.—The bay in which these two anchorages are situated nearly divides Uen Island; it is easily entered by all vessels during the prevailing wind by keeping a good lookout from the masthead for the sunken rocks which nearly bar the entrance. A sailing vessel on leaving must take the land wind in the morning, as the entrance between the reefs is too narrow to work out.

A coral reef extends 100 yards from the south point of the entrance of Port Kute.

Port Kuture is formed by the south side of Uen Island, Niagi Reef, and a small reef to the southward, and it is thus protected from winds in the northern half of the circle and from the sea in all directions. Anchorage should be taken within the line joining Nduru Point with the western point of the bay in order to escape the strength of the tide. The entrance from the eastward is easy by the southern passage, and sailing vessels may leave by the same with a northerly wind, observing that when the wind is in that direction the small reef on the east side should be approached during the ebb and avoided during the flood.

The exit by the western, or Nokue Passage, has some difficulties on account of the narrowness of the channel and the sharp turn necessary

to clear the point of black rocks off the extremity of the island. The tidal streams are very strong in that passage, and vessels drawing more than 10 feet should not attempt it.

Tioae Bay, on the west side of Uen Island, affords anchorage during strong southeast or southerly winds, in 10 to 13 fathoms with good holding ground, opposite a small sandy beach, bordered at the southern part by coconut trees. It is not advisable to go farther into the bay for fear of finding coral bottom.

Should the wind turn to southwest, weigh and run for Woodin Passage. When passing inside Tioae Islets it is desirable to be on the island side of the center of the passage, because on a line from the toe of Mount Woodin toward Little Tioae a depth of less than 5 fathoms extends nearly 400 yards from the shore, and from the islets a small reef extends about 160 yards.

Anger Bay, on the north side of Uen Island, is $\frac{3}{4}$ mile wide and the shores recede $\frac{1}{2}$ mile; it offers good shelter from the heaviest gales. Each side is skirted by a strip of coral reef narrow and steep; at the inner part there is a border of yellow sand, outside of which there is a bank of mud having only a few feet of water over it at 400 yards from the shore. Behind the sandy beach there is an extensive level plain, which is frequently under water; two rivulets flow through that plain, but they are difficult of access; the water is brackish during neap tides and salt during springs.

The best position for the anchor is in 11 fathoms, brown sand, with the extremes of the bay bearing 39° and 292° .

Pilot Bay, on the north side of Uen Island, about 1 mile eastward of Anger Bay, is nearly semicircular, about 550 yards wide, and affords good anchorage for small vessels; the best position is near the center of the bay in 13 fathoms, muddy bottom, more than 200 yards from the shore in each direction. The water is always smooth, but the tidal streams cause eddies which swing the vessel about continuously; the anchor will be too much embedded in the mud to foul, but it will be better to moor. The shore reef at the foot of the cliffs on each side are steep, nowhere exceeding a few yards in width, and disappear entirely opposite the red sandy beach at the inner part.

Water.—Fresh water of excellent quality is easily procured. Boats passing from Pilot Bay to Anger Bay, or the reverse, should be aware that during the strength of each tide a countercurrent runs very close along shore.

Woodin Passage.—This picturesque channel, which separates Uen Island from the mainland, presents a steep, clear shore on each side and is free from any known danger from Moziman Shoal at the northeast side of the entrance as far as the southwest end; the fairway depth is 16 to 26 fathoms. It is the only passage which should be followed by vessels from the eastward, as the whole space to the

southward of Uen Island is thickly studded with rocks and shoals, rendering an attempt to navigate that part both difficult and dangerous. Pine Point, which is the termination of a promontory on the north side, separating the passage from Prony Bay, also Montravel and the smaller islet off it, are each covered with fir trees. All the bottom of Woodin Passage is soft coral; nevertheless it is moderately good holding ground.

On the north side of Woodin Passage there is a large open bay, exposed to winds from the southeast; therefore anchorage in Anger Bay is far preferable. There is a good watering place at the northwest side of that bay, but vessels anchored in Anger Bay should not send their boats across, in consequence of the strong tidal streams in the channel.

Directions (continued from previous page).—From the steep termination of Cape Ndua the leading mark to the entrance of Woodin Passage is Ia Peak, bearing about 285° and seen between the two points of the entrance. By keeping the peak open of the points on either side Hydrography and Moziman Shoals (both marked) will be avoided, also the shoal which lies 1 mile 123° from the northeast point of Uen Island.

When taking this passage at night, or during the afternoon when the sun obscures the view, Cape Ndua should be kept to the northward of 89° till it is ascertained by bearings of the southeast end of Uen Island that the vessel is past Prony Reef (marked by a beacon). When the tide is contrary, a sailing vessel or steamer with small power should coast along the north side of Uen Island where it has less strength than near the center or on the opposite side.

Sailing vessels bound to the eastward from either Uie or Anger Bays, and intending to work through against an east wind, should only attempt it during the ebb, or on the last of the flood. Throughout the length of the channel each board may be continued very close to the shore, but by going far into the bay on the north side the strength of the tide will be lost. On leaving the passage care must be taken to avoid Moziman Shoal. If the wind should be too light to enable the vessel to clear Havannah Passage in one tide, the ebb will assist her into Prony Bay, from whence she can get away at any time, even during the last of the flood, which, with an easterly wind she could stem while leaving the bay.

From Woodin Passage to Noumea—Woodin Reef.—The first danger on the south side of the fairway westward of Woodin Passage is a reef by the same name (also called Ia Shoal), which is about 2 miles in length west and east. The central part has $2\frac{1}{2}$ fathoms over it, and lies about $4\frac{1}{2}$ miles 258° from the entrance to Woodin Passage.

Pine Point, open of the north extremity of Uen Island, leads northward of the shoal; that is, Woodin Passage well open.

On leaving Woodin Passage a course should be made west toward Tareti, passing to the northward of it, and continuing on the track shown on the charts to Noumea.

Tareti Islet is a sand cay 4 or 5 feet high on a moderately steep-sided reef on the south side of the fairway. Nakae Shoal and Kae Islet lie 3 miles farther westward on the northern side of the track.

Four Northern Banks.—This is a cluster of coral reefs and sand islets extending 2 miles northwest and southeast, on the south side of the fairway.

Provident Shoal lies $2\frac{1}{2}$ miles northward of Four Northern Banks and 5 miles 212° from Mount d'Or; it is of small extent and only covered by 1 or 2 feet; it is marked on its south side by a conical buoy painted black and red, with a top mark of the same color.

Porcupine Islet is the outermost of a group of small islands at the foot of Mount d'Or; it is rocky and remarkable for being the only one on the west coast which is covered with fir trees.

Oliver bank to the eastward is marked by a buoy. For other shoals out of the track, see the plan.

Uere Shoal, north side of the fairway, is 1 mile southeast from Ndoi Point has $2\frac{1}{2}$ fathoms water.

After passing Uere Shoal, Mando Island may be passed at a prudent distance from whence course may be shaped for Noumea.

From Noumea to Uen Island.—The first good stopping place which a well-conditioned sailing ship could reach at the end of a day is Anger Bay, on the south side of Woodin Passage. It is necessary to sail from Noumea early in the morning in order to profit by the land wind, which will take a vessel between Mando Island and the reefs off Maitre Island, taking care not to pass close to the north or northeast sides of the latter which are shelving. When to windward of those reefs there will be sufficient space to make long boards. When the wind is right ahead it will be preferable to stand to the southward during the flood and to keep close to the shore during the ebb.

When working to windward, and being to the eastward of the group of Islands which lie to the southward of Mount d'Or, care must be taken to avoid the dangerous rocks, Garnault, Morueti, and Oliver Bank, the latter marked by a black buoy on its southern edge. The Biessard Shoal lies with the summit of Nde Island bearing 307° distant 2.1 miles; it has $2\frac{1}{2}$ fathoms water and is marked by a green cylindrical buoy.

The clearing mark to the westward of these dangers is the peak of Mount d'Or well open west of Nde Island.

Steamers from abreast of Mando Island steer on the track shown on the chart. When in the vicinity of Woodin Reef (Ia Shoal) the whole of Woodin Passage should be kept well open while Ia Peak is between the bearings 55° and 21° .

Vessels of all classes and under all circumstances, when bound from Noumea to the east coast, should take the usual track, within the reefs, going through Woodin and Havannah Passages. The distance would be increased and much time lost by going out by Dumbea Passage and working around the Isle of Pines.

Anchorage.—If light breeze or other circumstance should cause a vessel to seek an anchorage before reaching Anger Bay, Uen Island, she will in all parts find better holding ground near the land than in the offing, and the following places may be found convenient:

First. In one of the coves in Bulari Bay, to the westward of Mount d'Or.

Second. Near Porcupine Island, on either the east or west side.

Third. At 1 mile north or northeast of Tareti, where good muddy bottom will be found.

Fourth. In Ngo Bay, which is a small, well-closed port, but in which calms will frequently prevail when there is a light wind outside.

Fifth. In Uie Bay, where the holding is good and water may be obtained at the northwest side and at the foot of Ia Peak.

It is not advisable for a sailing ship to go far into the bay as the wind would be later in reaching her next morning, also the bottom is rocky and uneven in the northeast part of the bay. Uie anchorage should always be taken by sailing ships encountering a foul wind and flood tide when approaching Woodin Passage, as it would be impossible to work against the tide.

Noumea, or Port of France, is the principal place in the colony, the seat of government, the residence of the governor of the island. It has a deep approach, available for largest vessels at all times of tide; a well-sheltered anchorage in roadstead, easy of access, in depth of from 6 to 8 fathoms, sand and mud bottom, over a space 2 miles long and 1 mile broad.

There is complete shelter in inner harbor in depths of from 6 to 8 fathoms, sand bottom, entered through Little Entrance, in which least depth is 7 fathoms.

Aspect.—When approaching from the westward, the high land in the vicinity of Noumea will generally be seen before the lighthouse; notably Mount Mu with its two horns; the mountain chain Kogi and a little to the right Mount d'Or, which is separated from Kogi by a remarkable valley. Mount d'Or bearing 34° will lead in the direction

of Bulari Passages, the principal entrance, to within range of the lights or lighthouse on Amedee Island. It sometimes happens that although the horizon may appear to be moderately clear and a distant view insured, yet the high land of Mu and Mount d'Or may not be seen till some time after the lighthouse.

St. Vincent Passage is commended to small steamers coming from the northwestward, as it insures smooth water within the reefs.

Pilots.—There is a regular pilotage establishment at Port Noumea, but vessels arriving outside the great reef, in the vicinity of Bulari of Dumbea Passages, must not always expect to find a pilot there waiting for them, consequently they should be prepared to enter one of the passages by the guidance of the chart and the following directions. At the end of 1887 the pilots of Noumea ceased to be government servants and were formed into a syndicate, with rules and regulations of their own.

Pilot boats have an anchor and number painted in black on the upper part of their sails, and a pilot jack is hoisted by day and a white light by night at the gaff when pilots are on board.

Pilot stations have been established at Amedee Islet, Noumea, Tchio, and Moueo (1900).

Vessels will be piloted according to the order of their arrival. All vessels except vessels of war and local coasting vessels are compelled to take a pilot at places where a pilot station has been established. Vessels bound for any other port, but wishing to call at Noumea, can do so by furnishing the pilot with a certificate to that effect.

Pilot dues.—Vessels passing through the Bulari Channel en route for Tchio on the east coast will pay half dues from Bulari Passage to Havannah Passage, in addition to those for entry to or departure from Tchio.

Full dues are paid by vessels coming from sea and taking a pilot, by vessels coming from sea which have met pilots and have not employed them, and by vessels coming from sea which enter or leave any port in the colony.

Vessels which take a pilot when in the channels will only be charged half dues, except in the Bulari Passes at night, when full dues must be paid. Where there is no pilot station, and no pilot goes out to meet the vessel, no pilotage need be paid. Vessels of war are piloted at half dues, and only pay when a pilot is employed.

Port regulations.—All merchant vessels must anchor only at the places indicated by the officers or masters of the port visited, they must have their flags flying, and if there is a case of contagious sickness on board must anchor at the quarantine station and have

no communication with the shore or bay until the vessel has been granted pratique by the health authorities.

A tax of 1 franc 50 centimes a ton is imposed on all foreign shipping entering New Caledonian ports other than Noumea.

NOTE.—Mariners proceeding to New Caledonia should understand that, Noumea being the principal port for entry and clearance, merchant ships must proceed there to obtain leave to visit any other port, excepting Tchio, on the east coast, at which place there is also a customhouse and pilots.

Bulari passages—General remarks—Depths.—Bulari passages form the main approach to port Noumea. They lie between Great Abore Reef to the northwestward and the Tumbo and Great Kue Reefs to the southeastward, with a total breadth of nearly 3 miles.

To Reef and Le Sournois Reef divide the entrance into three passages, known as the Northern, Central, and Southern Passages. All of them are deep and available for all classes of vessels, but the northern is lighted and is the one recommended, the track through which is shown by a dotted line.

Tidal streams.—In the Bulari passages the ebb stream runs out with considerable velocity; the flood enters at a more moderate rate.

Beacons.—A beacon stands on the northern side of the Great Abore Reef about $5\frac{1}{2}$ miles from its southeastern extreme. It is the northern approach to Bulari passages.

A beacon also stands on Great Kue Reef about 2 miles from its western extreme in the southern approach to Bulari passages. These beacons are about 12 miles apart and are useful in defining the reefs when approaching Bulari passes from either direction.

Northern (Bulari) Passage is 800 yards wide between Great Abore Reef and To Reef. Though this is the narrowest of the three passages it is preferred by the pilots, in consequence of being nearer and almost directly opposite the lighthouse; and because the two lights on Amendee Island in line leads through it; it should always be taken by steamers and by sailing ships when the usual southeast wind is blowing. The reef on the south side extends under water to seaward and that on the north side stretches inward, each to the depth of 5 to $6\frac{1}{2}$ fathoms.

Central Passage is the broadest of the three passages, being 1,400 yards, and the bottom in many places can be seen at a depth of 10 to 13 fathoms. This passage should be taken by sailing ships when working against an easterly wind and the preference should be given to the north side.

Sournois Rocks.—This bed of rocks, which separates the Southern from the Central Passage, extends about $\frac{1}{2}$ mile northwest and

southeast and must be carefully avoided; it has been called sly by the pilots because the sea does not generally break except on the shallow part near the center, and not always there. The central part is covered by depths of 1 to 3 fathoms. The clear width of the Southern Passage is about 1,100 yards. By taking that passage vessels more easily clear the shoals to leeward.

Southern Passage, between Tumbo and Sournois Reefs; the former is 2 miles long and is called by the pilots *le Tombeau* from the number of wrecks which it has occasioned in former times; it is very steep on the sea side, the north end is prolonged under water, but it should not be dangerous when due caution is observed, as the transparency of the water admits of it being seen plainly at a depth of 7 or 8 fathoms.

Lights—Amedee Islet—Leading lights.—This sandy islet, covered with bushes, and on which is a lighthouse, is situated about 2 miles within the northern Bulari passage and 10 miles from the nearest land near port Noumea, and is a most useful landmark for the entrances.

A fixed white light is exhibited from a cylindrical, white iron tower 174 feet in height at an elevation of 164 feet above high water, visible 12 miles.

A fixed red light is exhibited at 49 feet above high water from an octagonal base of masonry 30 feet high, surmounted by a cast-iron column 19 feet in length. This red light is visible seaward between 118° through east and north, and west from a distance of 8 miles.

These white and red lights in line 50° lead through the center of the northern Bulari Passage.

Tabu Light, on the east side of Tabu Reef, about 1 mile westward from Amedee Light, is fixed, showing white and red sectors. It is elevated 46 feet above the sea, and the white light is visible 12 miles and the red light 10 miles.

Ducrot leading lights.—From a masonry tower on Ducrot Hill, Dubouzet Island westward of Port Noumea, is exhibited a fixed white light elevated 236 feet above high water, visible 15 miles.

A fixed red light, 59 feet above high water and visible 8 miles, is exhibited from a pyramidal structure of masonry, 6 feet high, 300 yards 168° from Ducrot Light, to serve with that light as a leading mark between Ile Maitre and Ile aux Canards.

Uerendi (Pointe d'Artillerie).—Two leading lights are exhibited from Uerendi Point, on the eastern side of the inner entrance to Port Noumea. Both lights are fixed red. The upper light, shown from a tower constructed of masonry, is elevated about 39 feet above the sea; the lower light, distant 66 yards from the upper one, is shown from a turret and is elevated about 15 feet above the sea.

They are visible 4 miles and are obscured when bearing southward of 140° .

These lights in line bearing 62° lead through Little Entrance to the port. The structures are not easily made out.

Jetty Light.—On the east side of Denouel Point, abreast Uerendi, a fixed red light is shown from the end of the jetty, visible 2 miles.

Buoy.—To mark the southeast extremity of the shoal around Denouel Point, west side of Little Entrance, there is a black buoy, with battens forming a cone, surmounted by a cage.

Front light: On the edge of the quay, $\frac{1}{4}$ mile southward of the port office, is exhibited a fixed red light, visible from a distance of 6 miles.

Rear light: From the semaphore tower on the blockhouse, at 1,100 yards, 58° of the front light, is exhibited a fixed white light. This light is elevated 311 feet and visible from a distance of 10 miles.

These lights in line, bearing 58° , lead westward of Infernal Bank.

A white beacon light is shown from the end of the mole extending eastward from Picard Point.

Beacons—Dangers.—Amedee Shoal, with $1\frac{1}{2}$ fathoms water, $\frac{1}{2}$ mile 303° of Amedee Lighthouse, is marked by a beacon consisting of a staff and cage. Thisbee Shoal, with $1\frac{1}{2}$ fathoms, the western danger of Four Western Banks, is marked by a red bell buoy with conical topmark. Both these dangers are on the eastern side of the fairway.

A rock with less than 1 fathom water lies 350° , distant 3 miles from Tabu Reef Lighthouse, bordering the western side of the fairway. A beacon marks the extreme end of the reef extending eastward of Maitre Island.

Garnault Shoal is more than 1 mile to the westward of the direct course; it is about 50 feet in diameter, steep-to, and has $1\frac{1}{2}$ fathoms over it, coral, with the north extreme of Goelands Island bearing 298° , distant $2\frac{1}{2}$ miles.

Maitre Island (northeast end) is about 1.6 miles southwestward of Mando Island; it is covered with trees, and the southeast end of the reef, which extends from the island, is marked by an iron beacon, surmounted by a sphere 9 feet above high water.

Directions—By day.—To enter the Northern Bulari Passage during the day the two lighthouses on Amedee should be brought in line 50° and steered for, which leads in the fairway between Great Abore and To Reefs. When Tabu Reef lighthouse bears 325° the course should be shaped so as to pass between it and Amedee Shoal beacon.

As soon as Amedee Shoal is passed steer to bring Tabu Reef lighthouse to bear 177° astern, which mark will lead between the bell buoy

on Thisbe Shoal and the shoals to the westward of the fairway. There is a patch 600 yards in extent, with depths of 6 to 8 fathoms over it, just eastward of the fairway line here given.

Approaching Maitre Island give the beacon on its reef a prudent berth or pass it with Ducrot Light towers in line bearing 348° ; thence westward of Mando Island to the entrance (Little Entrance) to port Noumea. The directions for entering are similar to those given below for night.

By night.—Approaching Port Noumea by Bulari North Passage, Amedee Island Lights should be kept in line bearing 50° or a little open 49° , and when within the reefs Tabu Reef white light will come in sight; keep the same course until Tabu Reef light changes to red, when the course should be altered quickly to 342° or more to the westward, keeping close round Tabu Reef light to avoid Amedee Shoal, and thus enter the northern sector of white light shown from Tabu Reef; when within the sector steer 359° with Tabu Reef light bearing 177° astern, or southward of that bearing, which leads eastward of the patch with less than 1 fathom (and which patch is apparently within the white sector of Tabu Reef light) till the leading lights on Dubouzet (Nu) Island bear 348° ; steer for them on that bearing and Amedee Light right astern, which leads eastward of Maitre Island Reef and westward of Mando Island and the dangers northward of it.

If proceeding into port Noumea, when the leading lights on Uerendi are in line, bearing 62° , pass through Little Entrance with them in line, and when the light on Denouel Jetty opens out, bearing 348° , the course should be altered to about 21° for the anchorage, which will be reached when the jetty light and the lights on Uerendi become obscured.

Considering the tidal streams, vessels in the Bulari Passage and near Amedee Shoal should keep up a good rate of speed to insure turning quickly.

Outer anchorage.—If the wind should be from east or northeast, large sailing vessels, which are unable to work through the Little Entrance to the harbor or port, may find temporary anchorage outside in 10 or 12 fathoms, or by running past the south side of Dubouzet Island and entering the great roadstead to the northeast of it they will find sufficient space to maneuver while underway, or they can anchor there, if necessary.

Noumea Roadstead has a large space with convenient depth for anchorage, generally 6 to 8 fathoms; it is easy of access and perfectly sheltered. It is formed by Dubouzet Island, which runs parallel with the general coast line, and by Ducos Peninsula, from which it is separated by a channel or bay 3 miles long and about 1 mile wide. On the north side there are several small coves. There are

two entrances, that to the northwest being $\frac{3}{4}$ mile wide; the other is the north entrance to the port of Noumea.

Nda Point.—A reef which uncovers about 1 foot extends 250 yards south-southwestward from this point. A shoal of $3\frac{1}{2}$ fathoms is situated close southward of the edge of this reef.

Tides and tidal streams.—The tidal streams are feeble in the roads; the flood runs to the northward and the ebb to the southward. It has some force in the narrow strait inside Debrun Island. It is high water at Port Noumea, at full and change, at 8h., springs rise 4 feet.

Port Noumea.—**Little Entrance** is the name of the southern and principal entrance to Port Noumea, with depths of 7 to 8 fathoms. The northern entrance is barred, and the best water over it is not more than 14 feet approaching and about to enter the port in a sailing vessel; the west and north sides of Debrun may be passed at a distance of 200 to 100 yards; the direction thence up the harbor will be between northeast and north. Baffling winds or calm may be expected when under the lee of Debrun Island, but a vessel with good way will shoot past and by luffing up will weather Denouel Point and the shoal off it, which is marked by a black buoy moored in 3 fathoms.

Infernal Bank, on the east side of the fairway of the port, but extending far out toward the center of the harbor, has only $1\frac{1}{2}$ fathoms over it and is marked by a red buoy with cone on the fairway or western side, and a black buoy with cage on its eastern side.

Anchorage.—The Infernal Bank is left on the starboard hand in going up and anchorage taken in any vacant part of the harbor as convenient, in 8 to 10 fathoms, excellent holding ground, under the direction of the port authorities.

Moorings.—Naval moorings (small white buoys) have been laid down, three sets. If it is desired to utilize them permission should be requested; and there is a special buoy for the Messageries Maritime Co.'s vessels at which naval vessels have been permitted to lie when the steamer is not due.

North Entrance.—This entrance to the port is between Picard and Dumuri Points, where a ridge of rocks project from each side under water, leaving only a channel about 50 yards wide, with a depth of 14 feet at low water.

Beacon.—An iron beacon with a cylindrical topmark stands in False Entrance, 980 yards 191° from the southernmost angle of the battery on Verendi Peninsula.

Tir C ve.—Large nickel works, marked by a conspicuous chimney, are situated on Duiambo Point.

A pier extends from the abattoir southward of that point.

Livietta Point.—A stone pier extends from Mbi, on the eastern side of this point.

Shoals discovered—Nonexistence of shoal.—The captain of the French frigate *Kersaint* reports the existence of the following shoals in Noumea Roadstead:

A shoal 130 yards in diameter within the $5\frac{1}{2}$ -fathom contour, with a least depth of $2\frac{1}{2}$ fathoms, 787 yards 335° from Dubouzet (Nu) Island High Light.

A shoal 65 yards in diameter within the $5\frac{1}{2}$ -fathom contour, with a least depth of $2\frac{1}{2}$ fathoms, 1,400 yards 348° from Dubouzet (Nu) Island High Light.

The 2-fathom shoal shown on the chart about 930 yards 345° from Dubouzet (Nu) Island High Light was found not to exist.

Approximate position of Dubouzet (Nu) Island High Light on H. O. Chart No. 2875, latitude $22^\circ 16' 22''$ S., longitude $166^\circ 25' 15''$ E.

Supplies are plentiful at Port Noumea; bread of good quality may be obtained, and vegetables moderately good.

Water.—A supply of water of good quality may be obtained by boats from a pipe near the landing place, after obtaining permission from the captain of the port.

Coal.—There is usually a fair supply on coal on Dubouzet Island, principally belonging to the Government, and about 5,000 tons are imported annually. Two new sheds have been built between the naval coaling pier and Meynier Point, those in Boeufs Cove having been damaged by hurricanes. A considerable amount of coal is imported annually by mercantile firms; it is conveyed alongside in barges containing 50 to 250 tons each. The naval coaling wharf has a length of 200 feet with 26 feet alongside. Vessels lie about 16 feet from the wharf, as the bottom slopes and would endanger bilge keels. Merchant vessels coal alongside the town wharf.

Customhouse.—There was formerly but one customhouse in New Caledonia, Noumea being the only port for entry or clearance. Another has been established at Tchio, on the east coast.

Town.—The cathedral, situated at the southern part of the town, is conspicuous, and has a clock in each tower. The governor's house is not conspicuous; the official country house is in Canard Bay, southward of the town.

The suburbs of Noumea extend to Diuambo Point.

Wharf accommodation.—The town wharf has been extended northward parallel to the town to abreast Fort Constantine, and is now over 800 yards in length, with 26 feet alongside. It is connected with the railroad system. There are landing steps in places, as shown on the plan.

Vessels of 300 feet in length and 21 feet draft (1907) can coal alongside. They usually drop anchor before going alongside and have a stern hawser to the buoy abreast the northern steps for hauling off.

At Meynier Point (east end of Dubouzet Island), on the west side of the port, there is a mole, alongside of which the French naval vessels lie when coaling. A vessel can lie head and stern between the two mooring buoys off the mole. No unauthorized persons are allowed to land on any part of Dubouzet Island.

Railways.—A railway is being built which it is intended to carry as far as Bourail, about 100 miles distant; only about 10 miles were completed in 1907.

Patent slip in Bayonnaise Cove, with a cradle length of 227 feet, can take vessels of 150 to 180 tons weight. The owner proposed to make it capable of hauling up vessels of 350 to 400 tons weight. It is intended to construct a slip to take a vessel of 2,000 tons. A private foundry has been established, and the machinery is suitable for repairs to vessels of about 2,000 tons.

Repairs to French naval vessels are done by convicts; the general repairs are available for launches' engines.

Semaphore.—A square white tower standing at the back of the town 312 feet above the sea serves as a semaphore; it is visible at a distance of 20 miles to seaward.

Light.—A fixed white light with a red sector, visible 10 miles, is shown from the semaphore tower. For limits of sector see Light List.

Storm signals are shown on the mast of the port office and repeated on the yard of the semaphore.

The approach of a cyclone is made known by a ball over a red flag.

Quarantine.—**Fishermen Bay** is used as a quarantine ground.

Hospital.—There is a military hospital where seamen are also received.

Population.—The population of the colony in 1909 numbered 22,117 white, 3,336 Asiatics, and 23,833 natives. Noumea had a population of 9,437.

Communication.—A steamer under the French flag runs from Noumea to the Loyalty Islands and the New Hebrides about every four weeks.

Two regular steamers a month, both to the east and west coasts. The Australian United Navigation Co.'s vessels call at Anatam, meeting a small vessel of the same company, which collects all the produce of the other New Hebrides Islands, and consequently does a large trade.

The French mail steamers between Marseille and Noumea run once a month via Suez, Colombo, and Australia.

Dubouzet and Debrun Islands are connected by telephone with the mainland.

Telegraph.—There is a telegraph cable to Queensland, and telegraphic communication all over the island, and weekly overland mails by horses and runners.

There is a radio station at Noumea; call letters, A D O.

Dumbea Passage (Jitema) is the next opening in the barrier reef northwestward of Bulari Passages. It is nearly 13 miles from the latter, and will be found useful during the prevailing southeast winds to vessels bound to Noumea, that have approached the great Abore Reef to leeward of the Bulari Passage. It is more than $\frac{1}{2}$ mile wide and is deep.

Laregnere Reef lies $2\frac{1}{2}$ miles within the passage, on one of the lines for entering, the double peak of Kogi Mountain, seen over Mount Io, bearing 52° . The sea always breaks on Laregnere Reef.

Nge Islet, eastward of Laregnere Reef, stands near the center of a reef $1\frac{1}{2}$ miles in length east and west.

A rock of small extent lies about 3 miles eastward of Dumbea Passage, with Croui Islet bearing 97° distant about $2\frac{1}{2}$ miles. As the position of this danger has not been accurately determined, extra vigilance will be required in that vicinity by a sailing vessel. It lies out of the direct route.

Te Ndu Islet is about 4 miles 33° from Dumbea Passage; it stands on a reef about 1 mile in length north and south, and is composed of sand covered with trees. On the south end stands a stone beacon 56 feet high, colored white, and surmounted by a truncated cone.

Senez Reef.—This dangerous bank of coral is nearly awash, but never uncovers, and the sea only breaks on it during westerly and southwesterly winds, nor is it visible when in the direction of the sun. It lies 2 miles 83° from the beacon on Te Ndu Islet, and its position is marked by an iron beacon surmounted by a cage 12 feet above high water, standing 30 yards within the southern edge of the reef in 5 feet water.

The other dangers between Dumbea Passage and Dubouzet Island are all visible, and will only be in the way of sailing vessels when working in and out.

Freycinet Island, north side of Noumea Roadstead, is round, moderately high, and covered with trees. It sometimes shows out well in contrast with the land behind. The shallow passage to the southeast of this island is not used.

Directions.—On approaching Dumbea Passage from seaward there are several unmistakable landmarks by which the position may be recognized; but it must be borne in mind that as the open space is much less than the three passages at Bulari combined, the

tidal streams are more rapid and strong eddies are produced, accompanied by a hollow sea when the wind is contrary.

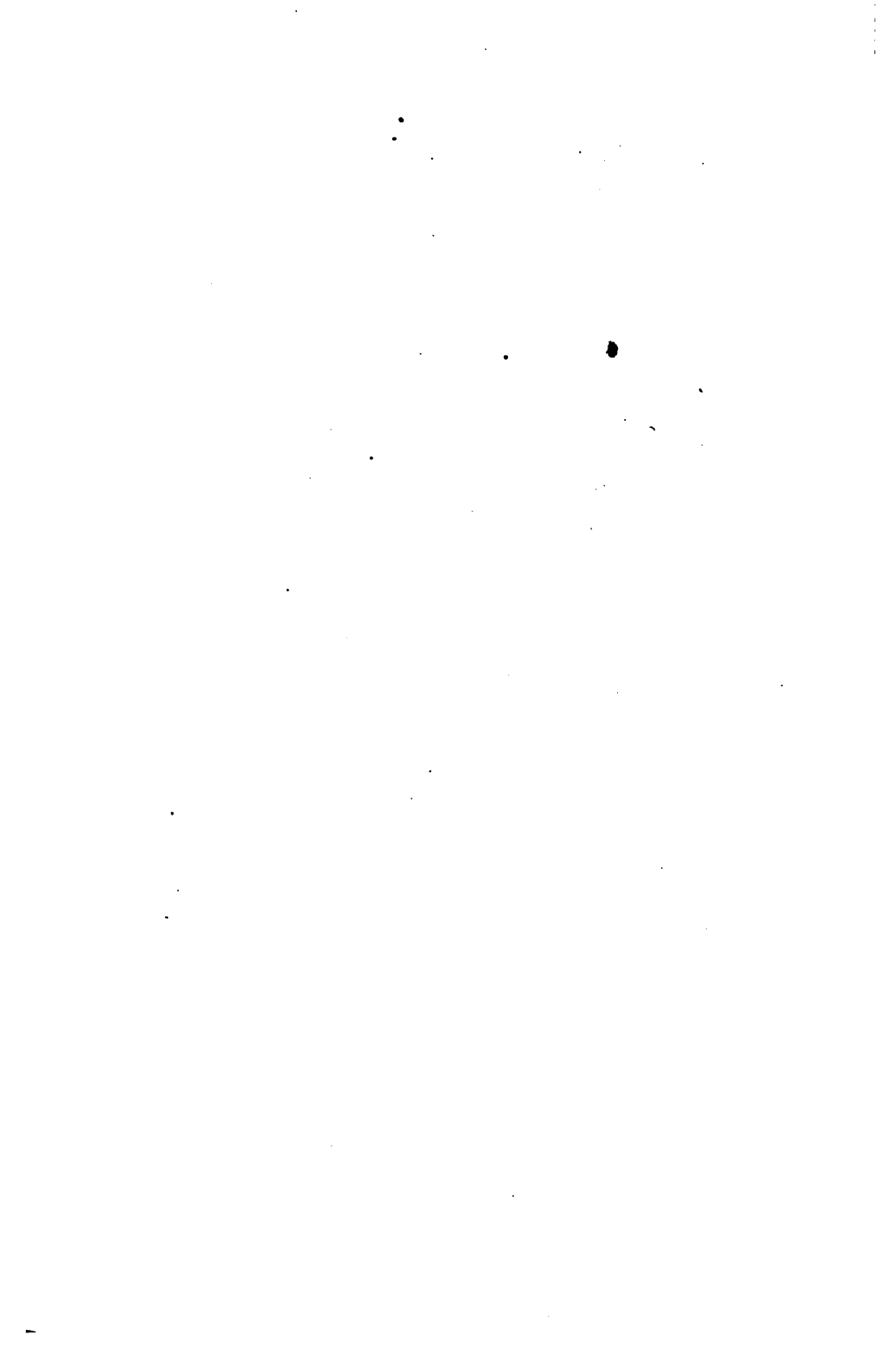
The double peak of Kogi Mountain, seen over Mount Io (on Dubouzet Island) bearing 52° , leads through the passage, but must not be continued beyond 2 miles as that line passes over Laregnere Reef.

The beacon on Te Ndu in line with the summit Kuiambo Peak, on the west side of Dumbea Bay, bearing 30° , leads obliquely through the passage.

As soon as the breakers on the reefs on each side are passed the course may be directed toward Freycinet Island, bearing 43° northward of Laregnere Reef. If it be desired to enter the roadstead of Noumea, that course should be continued till Montravel summit (north of Noumea) opens northward of Dubouzet Island, and the course then taken up the roadstead.

If going to Port Noumea, while steering for Freycinet Island, an being northward of Laregnere Reef, when the beacon on Te Ndu in line with the distant Peak Karikate, bearing about 315° , the course should be directed toward the white cliff on Uerendi Point seen through Little entrance; bearing 77° .

Sailing vessels having entered by Bulari or Dumbea Passage with winds about east or northeast will be obliged to maneuver between the rocks and shoals; their positions will be best understood by the chart. Hitherto the shoals and beacons situated near the direct track from one of the passages toward the port have been mentioned, but other beacons have been erected on the most dangerous places to facilitate navigation.



CHAPTER IV.

NEW CALEDONIA—SOUTHWEST COAST—DUMBEA BAY TO PORT MUEO.

Dumbea Bay comprises a number of smaller bays between the Ducos Peninsula on the southeast and Mestro Peninsula on the west. There are several good anchorages; the two principal places are between the islands Freycinet and Nie (north of the west point of Ducos Peninsula) in 9 fathoms, mud, and in Gadji Bay in $4\frac{1}{2}$ or 5 fathoms, soft mud; completely sheltered except between south and south-south-west. With a fresh breeze from southeast or south there is a short sea at the latter anchorage.

Maa Bay is situated to the northward and westward of the peninsula of the same name; the anchorage is protected in all directions but west, the bottom is sand with some heads of coral, the latter are especially found about the southern part. In order to avoid the long spit which projects to the westward of the peninsula, Kui summit should be open to the westward, or in a line with the western hill of the small peninsula which forms the east side of Port Laguerre, bearing about 353° , until Kuiambo Peak (on Maa Peninsula) bears 100° .

Port Laguerre.—This bay is inclosed by Te Ndu Island on the west; it is open to the southward. About the center there is a dangerous rock with only 1 foot of water over it; the exact position has not been determined, but it is between Te Ndu Island and the south point of the Vendioe River (Kati Ramono), rather nearer the latter. On entering it is also necessary to guard against a bed of rocks lying 123° , distant about $\frac{1}{2}$ mile from the south point of Te Ndu.

Anchorage will be found in 4 to 8 fathoms, bottom soft mud, protected from all winds but southerly. The inner parts of the bay are shallow.

At 2 miles northeast of the inner anchorage there is a jetty formed of trunks of trees; it is easily reached, as the depth varies from 1 to $\frac{1}{2}$ fathom.

Vandioe River (Kati Ramono).—The approach to the river is marked by stakes; the entrance, which is 1 mile above the landing jetty, is 15 to 30 yards wide; the depth inside is from 5 to 3 feet; the banks are lined with mangrove.

Inner Passage.—**Kaui Shoal** lies about 2 miles 235° of **Maa Peninsula**, and about 2 miles 325° of **Prony Reef** or **Bank**, of which it appears to form a part; it is covered by 2 feet of water, and a beacon marks the northern part of the shoal.

Ndue and Te Islands, with **Ndaru Reef** northward of them, stand on a reef about 2 miles in length, about $3\frac{1}{2}$ miles northwestward of **Kaui Shoal**. **Iange Islet** lies about a mile northward of them on the opposite side of the inshore passage.

Ti Reef.—This small bed of rocks 3.3 miles northwestward of **Ndue Island**, lies with the wooded islet **Mboa** bearing 297° distant nearly $2\frac{1}{4}$ miles.

Another reef, not marked by an islet, lies 1 mile east from **Mboa**.

Port Uitoe offers good anchorage and holding ground in 4 to 6 fathoms. The access from the southeast is easy with the aid of the chart. Landing is difficult, and there is no watering place. There is a crooked passage from **Uitoe** to the northwest in the direction of **St. Vincent Bay**, suitable to very small craft only; it will be necessary to avoid the shoal off the north point of **N'dukue Island**.

Directions—Port Noumea westward.—If the vessel's draft of water will admit, leave **Noumea** by the north entrance and steer about 297° through the roadstead toward the southwest peak on **Maa Peninsula**. When **Kungu Point** is passed the course may be shaped so as to round **Bovis Point** at about 250 yards, leaving **Kaui Shoal** and **Beacon** on the port side; thence the course will be about 300° a little to the westward of **Cape Ka**, which will appear to the northward of the east end of **Hugon Island**, the farthest land visible, passing midway between **Iange Islet** and **Ndaru Reef**, and, if continued, will lead to the entrance of port **Uitoe**.

Uitoe Passage lies about 14 miles northwest from **Dumbea Passage**, and is $\frac{3}{4}$ mile wide between the breakers. The principal landmarks to be seen from the offing are **Mu Mountain**, 4,000 feet; the much nearer are, **Karikate Peak**, 763 feet; and **Titema**, 1,170 feet, the latter may not be distinguished till close in; **Cape Ka**, the western point of **Matthew Island**, which may be known by its abrupt termination; the chain of wooded islands which inclose port **Uitoe**; also the detached outlying islets **Mboa** and **Mba**, which are likewise wooded, affording good cross bearings. The sea breaks on the reefs whereby the passage is easily recognized.

Close inside the passage, on the northern side, a 3-fathom patch lies nearly $\frac{1}{2}$ mile 123° of the point of the reef, with $4\frac{1}{2}$ fathoms southward of it, part of the same shoal. Vessels, even of light draft, ought not to pass over the shoal water as the sea caused by the southwest swell has been seen to break on it. A sufficient guide for clearing it will be to avoid going to the north side of the center of the channel.

The leading mark to the entrance of the passage is the eastern horn of Mu Mountain seen directly over Titema summit, bearing 65° . When the breakers on the south side are abeam 156° , the course should be changed to the eastward to avoid the shoal above mentioned, and a steamship bound to Noumea should steer direct 107° for the north summit of Dubouzet Island.

Sailing vessels from the south and bound to St. Vincent Bay, especially the southern part of it, should enter Uitoe Passage in preference to St. Vincent Passage.

St. Vincent Bay.—A description of all the islands and rocks in this large bay will not here be attempted; they are shown on the chart. A few observations only will be made on the principal passages which may be followed. The water in the bay is so muddy that the shoals can not be seen, consequently bearings and leading marks are alone to be depended on.

Directions into St. Vincent Bay.—From off Cape Ka (where the description of the last inner track terminated, see above), if it be desired to go to North Bay, which is to the northward of Ducos Island, the course should be shaped through the passage and to pass close to the eastward of the eastern Trio Islet; those islets are on the east side of Hugon Island and are high. As soon as that islet is passed the course should be about north, toward the southern hill on Parseval Island, so as to pass between the east end of Ducos Island and Marceau Reef, which latter is marked by a beacon.

The track should then be continued close to the northeast end of Ducos Island, in order to avoid another small reef which lies 400 yards north from that point; it uncovers at low water and is marked by a beacon on its shallowest part. As soon as the small peninsula Beaupre opens out from behind Devarenne Island, the course should be toward Death Islet, which should be passed very close on its west side in order to avoid Cher Rock, which is covered by 7 feet at low water and lies 500 yards 269° from Death Islet.

If it be desired to anchor in North Bay, a berth may be chosen according to the draft of the vessel. The bottom is soft mud and excellent holding; but with a moderately fresh breeze from south-east the sea is short and hollow, very dangerous for boats, especially when crossing the shallow water outside the river.

Telegraph.—There is a telegraph station at St. Vincent.

Uaniana River.—From the anchorage in North Bay northward toward the bar of the river the depth decreases gradually; the bar, which is about 300 yards from the mouth of the river, is composed of sand and mud, covered by 2 or 3 feet at low water; the channel is marked by stakes. Within the bar the depth is 6 to 10 feet. The river is 100 yards wide and the depth there is 3 to 6 feet, but

some small mud banks which dry at low water render the channel difficult.

Landing place.—At 1 mile within the river Olri Quay has been built with trunks of trees, at which small vessels drawing 5 feet may discharge alongside conveniently. A southeast wind renders the passage over the $2\frac{1}{2}$ miles of shallow water both disagreeable and dangerous.

Arembo Bay (Burake).—If it be desired to anchor in this western part of North Bay, after passing the narrow channel between the northeast point of Ducos Island and the beacon on the reef to the northward, shape course about midway between the islets Marceau and Woody, thence, in order to avoid the bank covered by 24 fathoms which lies to the northwest of Marceau, steer toward Kari Peak (870 feet) till Ducos Passage opens, when the bank will be cleared and the vessel's head may be directed midway between St. Phalle and Daussy Islands, choosing the anchorage according to the draft of water and convenient distance from the reef.

Lepredour Passage.—This exit from the northern part of St. Vincent Bay completes the track inside those large islands. It is formed by the small peninsula Burake and Lepredour Island, and from the latter a low point with a sandy beach projects into the channel; to avoid it a preference should be given to the Burake or north shore, which is steep-to. The passage is suitable for vessels with a draft less than 13 feet.

Water.—There is a small watering place within the channel on the southeast side of the sandy point, where boats may load.

St. Vincent Passage.—This is the next opening in the great reef, and about 11 miles northwest of Uitoe Passage. Tenia Islet, which stands on the reef about 1 mile northwestward of the elbow which forms the channel, is wooded and may be seen at a distance of 2 or 3 miles; it indicates the position from seaward.

The leading mark through the passage is the cliff on the northwest point of Ducos Island bearing 52° . From the middle of the passage the small peninsula Beaupre will be seen in the center of Ducos Passage; it is black and easily distinguished.

Steamers from the northward and bound to Noumea would secure the advantage of a smooth water passage within the reefs by entering here.

Directions—Inner Passage (continued).—On leaving a position off Cape Ka there is a track outside all the islands which inclose St. Vincent Bay and inside the barrier reef. The chart is a better guide than any description.

Pritzbuer Bay.—Throughout the inner navigation there is suitable ground on which a vessel may anchor during a fog or for other

reasons, but the only good shelter will be found in the eastern part of Pritzbuer Bay, in about 7 fathoms, with the hill on Moziman Point (the north point of Puen) bearing 224° . That point should be rounded at a distance not much exceeding $\frac{1}{2}$ mile, in order to avoid the shoals to the southward of Testard Islands, which extend 670 yards beyond the small bushy islet.

Caution.—A rock with less than 6 feet water lies near the fairway southward of Testard Island, with the rock off the southeast point of that island in line with Kari Peak 47° , distant $\frac{1}{2}$ mile, and the east extreme of Isie Island in line with Mount Uanvo 318° ; this latter bearing being the leading line for the channel when proceeding from the St. Vincent Pass to Isie Pass, care must be taken when proceeding westward to keep the mount open northward of the island when the north point of Puen Island bears east until Kari Peak is in line with the southern end of the Testard Islands, when the leading line can be resumed.

Isie Passage.—From some distance in the offing the small peninsula on which stands Uanvo Hill will be seen, having a similar appearance to Lebris Island at Uarai to the westward, both in form and color. The wooded-islets N'digoro on the barrier reef and Konduyo in the open space within will be seen, as well as Isie Island, on which there are two smoothly curved mounds; also at the east end of the hills on Uanvo Peninsula, Meleo Cone will be distinguished 330 feet high and should be brought to bear 59° , which line will lead through the passage. When within the entrance the sand and patches of coral which form the bottom will be plainly seen. This passage is sometimes used by vessels belonging to the locality.

Beacon.—A beacon surmounted by a ball marks the southwest end of Konduyo Reef within and eastward of Isie Passage.

Uarai Passage.—The position of this passage may be known by Lebris Island, 3 miles within the passage and N'digoro Islet, on the reef at the south side of the entrance. The leading mark for the entrance is the summit of Lebris in line with Mount Fombiru in the background, 45° . When within the reefs the track to Uarai Bay or to St. Vincent may be followed.

Uarai Bay.—On the east side of the entrance to this bay stands Lebris Island, 279 feet high; it shows very distinctly against the land behind.

Beacons and buoys.—An iron beacon with a cage on top, 9 feet high, is fixed on the south extremity of the reef which extends nearly 1 mile southward of Lebris Island.

A buoy is moored on the edge of the reef on the west side of the entrance to the bay, opposite Lebris Island and its reefs.

Directions.—Vessels in the inner passage proceeding westward toward N'digoro Islet on the barrier reef, and intending to proceed to Uarai Bay, should bring the beacon on Lebris Reef on with the west side of Teremba, to pass southwestward of Konduyo Reef beacon, and steer toward them. Or, when Teremba Islet bears 336° the course should be toward it on that bearing which will lead close to the beacon on Lebris Reef; the passage will then be plain between it and the buoy to Uarai Bay.

In the absence of the beacon, the end of Lebris Reef may be passed in safety by not allowing Konduyo Islet to open to the right of the most distant land (which is Hugon Island) before Gero Islet (close off the northwest side of Lebris) shows detached from that island; then the course will be between the west side of Lebris and the buoy; the island side should be kept.

Anchorage.—After running 2 miles northwestward of Lebris good anchorage will be found in 6 to 4 fathoms, muddy bottom. During bad weather a small vessel will find a good berth to the northward of Teremba Islet in 3 or 4 fathoms, soft muddy bottom. At this anchorage the southeast wind is said to cause a heavy short sea rendering boating difficult, especially when the flood stream is running into the river; the lighters are frequently obliged to wait for the usual calm at night before going alongside a vessel.

Landing.—The boat passage to Uarai is marked by stakes at intervals. Near the first stake, at about 1 mile from the anchorage off Teremba, there is a bar of sand and mud, covered by 3 feet at low water, after that is passed a depth of 10 to 13 feet will be found. A boat drawing 6 feet can anchor about 600 yards from the landing place, which is $2\frac{1}{2}$ miles from the anchorage off Teremba. A rough mole 60 yards long and $7\frac{1}{2}$ yards wide has been constructed of loose stones, which, with a small jetty of similar construction, forms a camber in which the lighters and boats belonging to the place are secured.

Muendu Bay (Mara Cut).—This opening in the barrier reef is 7 miles westward of Uarai Passage and should only be taken by those locally acquainted. (The inner navigation between Uarai and Muendu is only practicable at high water by small craft whose draft does not exceed 6 feet.) Larger vessels when bound to Muendu must go outside the reef and enter by Mara Cut; the narrow entrance requires great care, especially with a sailing vessel, which should not attempt it except with a fair and steady commanding breeze.

After the entrance has been discovered by means of the bearings of remarkable objects, the course in will be 27° toward a patch of breakers more than $\frac{1}{2}$ mile within the outer part of the cut. When at $\frac{1}{2}$ mile from the breakers the course will be close round the steep

elbow of the reef on the west side to about 336° following the edge of the reef. Care must be taken to avoid a rock, with less than 6 feet water, which lies off the western extremity of the reef on the east side. After passing that rock, the course will be about 44° . When the south point of Mara Island bears 89° the course will be 21° . When the narrowest part of the channel leading to the basin; after that is passed anchorage may be taken in from $4\frac{1}{2}$ to 3 fathoms; at the latter depth the south point of Kondogi will be slightly open of the south point of Mara Island.

Vessels drawing less than 13 feet may go farther up in a narrow channel. There is no description, but the plan and a good lookout from aloft will possibly be sufficient guide. Through the outer part of the bay, except after heavy rain, the line of demarcation between the sand and coral forming the reef and the great depth over a sandy bottom is always visible.

A sailing vessel should not attempt to go out of Muendu Bay without a well-established fair wind, unless assisted by a tug.

Between Muendu and Burai there is no passage within the reef for vessels of greater draft than 6 feet. A strong current has been found in the middle of a crooked channel which has generally a depth of 6 to 8 feet over a sandy bottom, on which a number of rocks are scattered; it is only suited to coasting vessels and is so used.

Burai Bay is situated 15 miles westward of Muendu Bay and affords good anchorage. Siande Island, standing on the reef 1 mile eastward of the entrance, is wooded and is a useful mark for fixing the position. The entrance presents no difficulties when in the fairway of the entrance, the cliff on Point Akaia, southeast side of the bay, will bear 38° , but the summit of Mount Neku, about $1\frac{1}{2}$ miles within the head of the bay and 1,594 feet high, being north or 13° , will head in from sea direct to the anchorage. A little to the right of the mountain will be seen the north end of a long sandy beach bordering the flat island which separates the two branches of the Nera River.

Leading lights.—Front light: From an iron post, erected at 600 yards east-northeastward of Banambe Point, is exhibited a fixed red light, elevated 141 feet, and visible 10 miles.

Rear light: From an iron post, erected at 320 yards, 16° of the front light, is exhibited a fixed white light, elevated 236 feet, and visible from a distance of 10 miles.

These lights in line, bearing 16° , lead into the bay and to the anchorage.

A fixed green light, elevated 6 feet above the sea, and visible from 73° , through east, to 128° (over the anchorage), about 4 miles, is shown from a shed situated on the point forming the northern side of the southern entrance to Nera River. (See Light List.)

Anchorage.—There is good anchorage in every part of Buria Bay, but the northwest part is preferable even in the fine weather season; notwithstanding that during the southeast trade wind, the swell of the ocean is felt there, while the water is undisturbed in the southeast part, but directly the wind blows from west at sea a swell enters the latter part in such a manner that it breaks from Akaia Point to Beutaue Rocks and renders the entrance to the river impracticable.

Telegraph.—There is a telegraph station at Burai.

Burai town.—Mero River is an insignificant stream which is lost in the sands of the beach on the northwest side of Burai Bay; Burai settlement lies in the cove just northward of it.

There is an opening in the reef about 400 yards wide at the entrance, diminishing to 50 yards at a distance of 400 yards from the points; the whole length is about 650 yards. The depth in the first part is from 5 to 4 fathoms, over a sandy bottom; as it becomes narrower the depth also decreases to 1 fathom. Nearer the shore is a bed of sand and mud 400 or 500 yards wide which dries at low water off Mero River.

N'diadiu Bay, on the east side of Burai Bay, is accessible to large boats.

Coast—Cape Goulvain Cut.—Between Burai and this place it is impossible to navigate within the reefs, which at about midway between the two places project much farther than the charts indicate. Goulvain Cut is not suitable for vessels, and leads to nothing.

Contrariete Islet (Porondu).—This islet is low and wooded, standing on the north side of a very salient point of the barrier reef which forms Poya Bay. On the edge of this reef the French ship *Cher* was wrecked in 1885.

Poya Bay, between Beco Peninsula and Cape Goulvain, is 2 miles in depth and $1\frac{1}{2}$ miles wide, and is only suitable for small craft. Two rivers, named Poya and Moindah, navigable only by boats, flow into the head.

The entrance northward of Contrariete (Porondu) Islet is nearly 800 yards wide and is found on the bearing of Adio Peak 55° .

The reefs are marked by buoys and beacons, and there is good anchorage in from 3 to 6 fathoms, mud bottom, with Eure Point 336° and a yellow hillock eastward of Kuil Point 72° .

The best landing is on the western side of the bay; on the eastern side landing can only be effected at high water.

Port Mueo—Mueo Pass.—From the offing Adio Peak, Mueo Needle, Contrariete Islet, and Cape Goulvain are the principal objects by which the position may be known. Adio Peak will be seen from seaward between two high ranges. The one on the left presents a slope almost perpendicular. Mueo Needle is a slender peak standing on a slightly rounded mountain; to the right of the needle

another will be seen on the mountains, but it is smaller and less pointed.

Buoyage.—Black buoys mark the western and northern side of the channel and red buoys and beacons mark the southern and eastern side; not to be depended on.

Two buoys have been established on the port (western) side of the channel leading into Port Mueo, southwest coast of New Caledonia, South Pacific Ocean.

One of these buoys is moored 1,700 yards 240° from the red buoy marking the $\frac{1}{2}$ -fathom shoal 1.3 miles 218° from the western point of Kiamu (Grimoult) Island and the other about $\frac{1}{2}$ mile westward of the same red buoy.

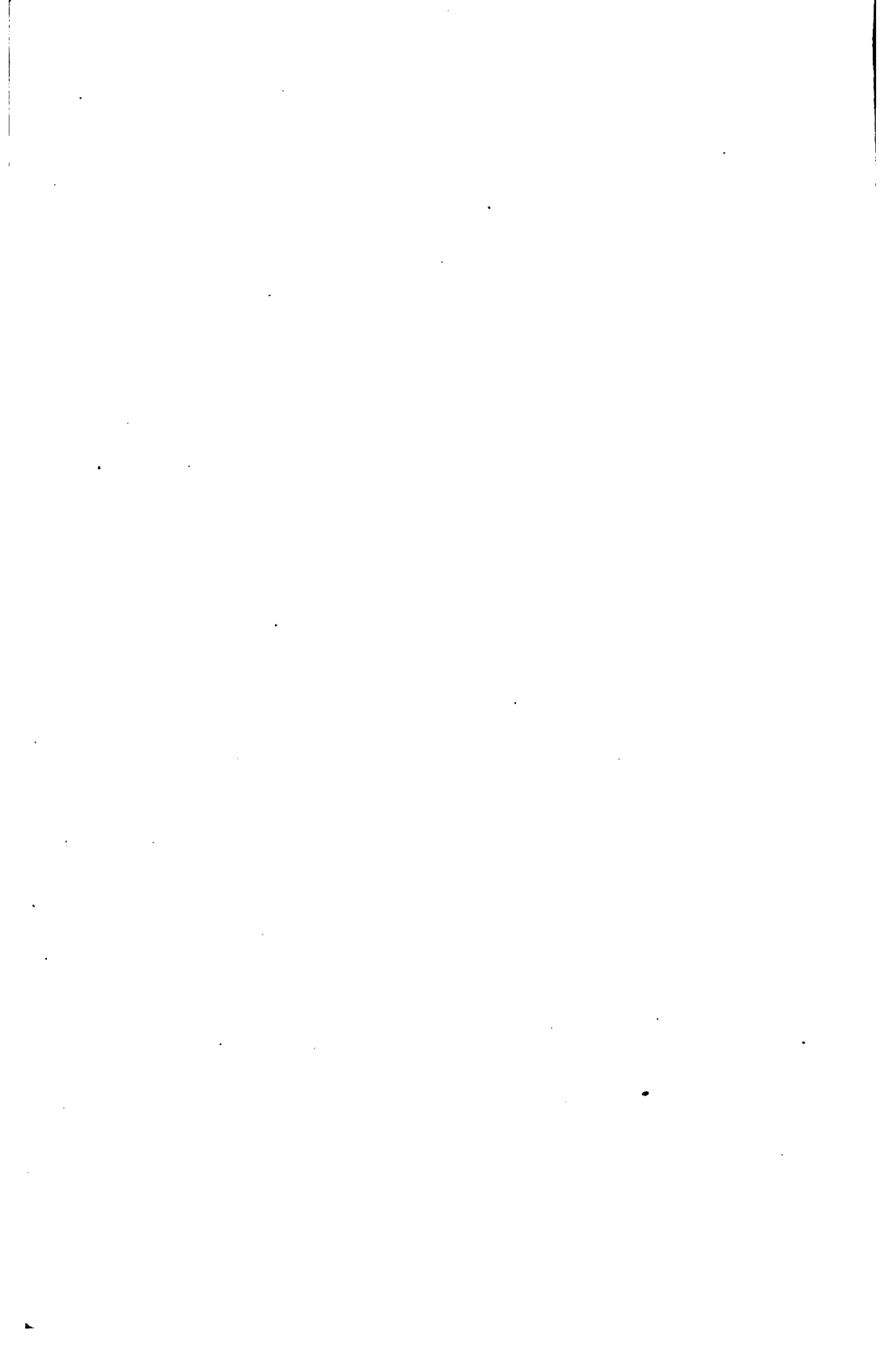
A white beacon with ball as a topmark marks the 1-foot rock on the eastern side of the entrance of Nepui Bay.

Directions.—Sailing vessels should not take the Mueo Passage unless sure of a steady wind which will allow them to steer about 66° , well free, and then only with local knowledge or with the assistance of a pilot. The entrance is not easily made out, but Adio Peak bearing 75° will lead up to it, when the ship must be conned from aloft.

The passage may be entered by keeping the white beacon on Bèco Peninsula in a line with the south point of Didot Island, bearing 72° . A small house on the crest of the first range of hills is on the same line and may be used instead of the beacon.

From abreast the north end of the southern reef at the entrance a course should be shaped 95° toward the perch on the 3-foot patch, which should be passed at a distance of about 20 yards on its north side. When the white beacon on Ie Island shows clear of the southeast point of Kiamu, bearing 52° , that line should be followed until the white beacon on Nepui Peninsula is just open of the west point of Kiamu, bearing 13° . That line should be followed (taking care to avoid the 2-fathom shoal on the port hand, which is marked by a buoy) till the southern points of Kiamu come in a line, or a little before they form a line. The course will then be 350° toward Observatory Rock, in which track a perch on the western edge of Kiamu Reef will be passed at 200 or 400 yards on the starboard side, and after it is well abaft the beam the course may be shaped toward the beacon on Nepui and the anchor let go in any part of that open space to the southward of Nepui in 6 or 7 fathoms, muddy bottom.

Telegraph.—There is a telegraph station at Nepui.



CHAPTER V.

NEW CALEDONIA—NORTHWEST COAST—PUEMBUT PASSAGE TO BELEP ISLANDS.

Kataviti Bay—Puembut Passage.—From a short distance to seaward of the breakers on the outer reefs, Kone (Gate) Mountain will be seen; it is black and wooded. On the bearing 44° there is a small hill appearing close to the eastward of Koniene Island, which may be used for approaching the entrance. Koniene Island presents two small peaks which are remarkable. To the eastward of Koniene and the above-mentioned hill there is a flat-topped hill in the form of a table; it inclines slightly to the southward and at its west side there are two conical mounds like horns.

Directions.—The passage should only be entered by those locally acquainted or with a pilot obtained from Port Mueo. The chart shows a reef in the middle of the entrance. Approach the entrance while steering (about) 44° (with caution), toward Mount Kone, till the left side of the table part of the hill is seen between the two horns above mentioned; the course will then be more to port, a little to the westward of the north point of the cliff at Foe Village, which will lead to the anchorage; taking care not to go farther than to have Mount Kone being 65° . On that track a rock covered by $2\frac{1}{2}$ fathoms will be left on the starboard side.

A black buoy lies 100 yards west of the track leading to the Foe Channel on the north edge of the reef which lies close to the north-eastward of the Koniene Reef.

A vessel not drawing more than 16 feet may anchor at the entrance of Kataviti Creek; but there is a high, short sea there during south-east winds, and on entering care must be taken to avoid the rocks which project from the inner part of the reef extending from Koniene Island.

Telegraph.—There is a telegraph station at Puembut.

Kone Passage.—This passage is not recommended, as the channel is tortuous and encumbered with rocks; also the tidal streams are strong and the swell is very heavy at the outer part.

Duroc Passage.—It is not possible for anything larger than small coasting craft to navigate within the reefs between Kataviti Bay and Duroc Passage; but seagoing vessels may enter by Duroc Passage and proceed westward along shore from thence.

Duroc passage is long and narrow, and the conspicuous points by which it may be recognized from seaward are numerous.

Aspect—Landmarks.—To the northward of the parallel 21° S. as far as the high land of Pume a series of isolated mountains will be seen near the coast, having characteristic features in the form of peaks and domes. Within 18 miles northwest of Duroc passage the following will be seen: Tsiba Peak (nearest the sea), 1,545 feet; Mount Uala, 1,899 feet; Mount Uzangu, 1,919 feet; and Homedebua Peak, 3,937 feet.

At 61° from Duroc Passage stands Mount Katepahie, 2,129 feet high, remarkable for its dark color, also by the sides being jagged and the upper part flattened. To the east will be seen the red ferruginous ground of Kafeate, which stands up from a large plain, and to the northwest of it stands Kafeate Peak in the shape of a sugar loaf. In the foreground there is Guillain Peninsula, Gatope Islet (frequently undistinguishable from the land behind it), Puani and Vuavuto Peaks, standing one on each side of Vuavuto Creek; the former is the highest part of Guillain Peninsula; these may be added to the others as landmarks which, with the one exception, are easily distinguished from seaward.

Directions.—Katepahie Mountain should be brought to bear 48° nearly in a line with the extremity of Guillain Peninsula, and the passage entered; but that line must not be continued, the course must be directed from aloft. To proceed by the route alongshore westward the eastern edge of Great Gatope Reef would be followed; if about to enter Vuavota Cove. The black buoy on the elbow of the reef on the west side of the passage will also be a guide if in position. It would be imprudent for a sailing vessel to enter this passage unless able to run through with a commanding wind and with local assistance.

Vuavuto Cove is on the south side of Guillain Peninsula and inclosed by Vuavuto Point; the passage leading to it is narrow and difficult, the water is charged with mud from the rivers Temala and Voh, which prevents the terminations of the reefs being seen.

A channel into Vuavuto has been buoyed, permitting ships drawing 23 feet of water to enter the bay of Vuavuto and anchor in depths of 6 fathoms, soft mud. This channel is named the Frot Channel, and is only practicable for steamers. A pilot is recommended by the French authorities. Pilots are obtainable at Noumea.

The channel is marked as follows: At the entrance, which opens in the reef southeast of Duroc Passage, a beacon surmounted by a conical top mark is placed a little to the east of the point of the South Reef, a point clearly marked by the rollers which always break there. On the south shore of the channel there are three red buoys numbered 1, 3, 5, and on the north side five black buoys, numbered 2, 4, 6, 8, 10.

On land a leading mark is formed by two pyramids, placed one on Vincent Point, the other on the beach in the bight of the coast, which follows Vincent Point. In the bay a white buoy is placed marking the anchorage.

Directions.—Making for the anchorage of Vuavuto, follow the leading mark for Duroc Passage until the beacon on the point of the South Reef bears about 134° . Steer then 128° so as to pass into the middle of the passage between the beacon and No. 2 buoy; when between Nos. 3 and 6 buoys alter to 76° to pass between Nos. 5 and 8 buoys, thence 67° with the two pyramids on St. Vincent Point in line, and so on to the anchorage.

For time of high water, add 35 minutes to time of high water at Noumea; this gives 8h. 35m. full and change.

Chasseloup Bay.—The anchorage in this bay is very good; it is protected from all winds, and the outer reef protects it from the sea which is raised by westerly winds; the holding ground is excellent. A white house, conspicuous from seaward, is situated 2 miles 21° from the station on the south side of the bay.

A bank of coral, with a least depth of 5 feet at low water, lies about $\frac{1}{2}$ mile off the center of the head of the bay within the 3-fathom curve.

Puako Cove and Puangue.—At both places there is a short, disagreeable sea during the prevailing southeast wind, especially when opposed to the tide. A bank of mud and some detached patches, with 2 to $2\frac{1}{2}$ fathoms over the outer part, extends $1\frac{1}{2}$ miles to the southeast of Puangue, greatly reducing the width of the channel between the coast and the outer reef.

Puangue Channel, which commences westward of Chasseloup Bay, forms a curve about $2\frac{1}{2}$ miles in length; it is the only way within the outer reef by which a vessel can pass to the northward. The reefs which form this channel are generally visible, but the passage would be dangerous at the time of high water in the absence of the beacons, especially if the sun should be ahead, preventing the limits of the reefs being seen.

This channel should not be attempted by a stranger.

Alliance Cut.—This opening in the barrier reef between Great Gatope and Great Mathieu Reef is 550 yards wide and in the center no bottom with 22 fathoms of line, and the tidal streams are often very strong in it. When within the passage the inner track as hereafter described should be followed till the survey of the whole inner space has been completed; with that object the course should be toward the low point Paquiepe.

In consequence of the development of a factory at Uaco, the chimney of which stands nearly 1 mile 66° from the extremity of Unda Point, Alliance Cut is now used even by sailing vessels seeking the anchorage in Unda Bay; they thus avoid the long round which they

otherwise would have to make after entering the reef by Duroc or Deverd Passes.

Vessels approach Alliance Cut while keeping Homedebua Peak bearing 27° , and for going through the passage they must be guided by the sight of the edges of the reefs, which are very apparent and may be passed close on each side.

Within the cut the same bearing of Homedebua Peak, 27° , will lead at equal distance between the reefs Peterson and the sunken heads extending 156° from Unda Reef; on the latter track the least depth is $4\frac{1}{2}$ fathoms on the line joining Peterson and Unda Reefs.

Inner route—Gatope Reef to Gomen Bay.—To proceed westward from Chasseloup Bay (from direction heretofore given), Ka-feate Peak should be kept in line with the western peak of Gatope Islet astern, keeping along the edge of Great Gatope Reef until the south point of Puako Cove comes on with the summit of Katepahie, when the course should be immediately altered to port to enter the channel, leaving the first beacon on the starboard side. By keeping near the center of the channel the second beacon will be left on the port side and the third on the starboard side. On leaving the channel Massacre Flat should be followed moderately close, the course being a little to the left of the beacon, which will be seen on the edge (of the southern elbow) of the northwest part of Massacre Flat where it projects opposite Peterson Reef. The track should be close on the west side of the beacon in order to avoid a $2\frac{1}{2}$ -fathom shoal which lies 650 yards 134° from the south end of Peterson Reef.

On leaving Peterson Passage the course should be about 339° toward a small pointed hill, close to the shore, $2\frac{1}{2}$ miles northwest of Unda Point, which is low. When the coconut trees on Unda Point come on with Tsiba Park, the course should be alongshore toward the summit of Teudie (a hill standing on Cape Deverd) till the small pointed hill (above mentioned) northwest of Unda Point comes in a line with Tsiba Peak, when the course will be about 302° toward Deverd Islet, which has trees on it; that line will lead between the Four Sisters Reef and another about 1 mile northeast of it. As soon as the small hill on Iuanga Point shows out from Cape Deverd, bearing 359° , the course will be 336° , which will lead through the open space between the cape and the shoals attached to Deverd Islet.

Unda Bay.—In the track just described sailing vessels making the passage from north to south may find temporary anchorage in Unda Bay, near the north end of Massacre Flat, in 3 or 4 fathoms, mud. They could take advantage of the land wind, which generally prevails during the morning, to go through the narrow channel eastward of Peterson Reef.

A wharf 404 yards in length extends in a northwest direction from the south part of Unda Point.

Barrier reef—Great Mathieu Reef.—This part of the outer reef extends about 16 miles, from Alliance Cut to Coetlogon Passages. It has not been thoroughly surveyed, therefore, the representation on the chart must not be too much trusted. When running along the outside of this reef much caution is necessary.

Coetlogon Passages were so named after the first ship which passed through them in December, 1860. There are two distinct passages named Deverd and Kumak, separated by a reef 3 miles in length which lies 2 miles within the line of the great outer reefs.

Deverd Passage.—A number of large bowlders lie on north end of Great Mathieu Reef, which forms the south side of the entrance. At about 2 miles 80° from the bowlders, and at 1,530 yards south of the reef which separates the passages, there is a shoal in the fairway with $3\frac{1}{2}$ fathoms. On approaching it care must be taken to clear it on either side.

Kumak Passage.—As a guide from seaward the summit of Kaala should bear 63° . The wooded islet Kendec which, with its reef, divides the passage, is also a useful guide, as when in line with Pandop Peak bearing 37° it leads into the center of the passage, but diagonally. On entering between the reefs it must be decided on which side to pass Kendec. When the reef around the islet can be seen, the southern side should have the preference. The channel is over 400 yards wide and the reefs on each side are steep. After entering the passage one of the inner tracks may be followed.

When the tidal streams are strong, the access to either of those divisions of Kumak Passage is difficult for sailing vessels. Similar vessels from the northward should not attempt to go out by the western side of Kendec unless assured of lying 156° ; it will then be necessary to range close along the side of Kendec Reef and stem the stream. Outside the islet the depth is too great for anchorage.

Telegraph.—There is a telegraph station at Kumak.

Gomen Bay.—A vessel from Deverd Passage, or having arrived off Cape Deverd by the inner channel from the southeast, may round that cape at a distance of $\frac{1}{2}$ mile. Small vessels may advance till the top of Teudie bears 201° and Deverd Islet just covered by the cape of the same name. Larger vessels should anchor farther out with the islet entirely open.

This bay affords shelter against easterly winds, but it is shallow and the mud is so soft that the very high seas raised by northwesterly and westerly winds disturb the bottom to such an extent that the anchors have no hold. The place should therefore be avoided when the wind is in that direction.

Submarine cable.—The telegraph cable connecting Harvey Bay, Queensland, with New Caledonia is laid in Deverd Passage and is

landed in the southwest part of Gomen Bay. Two white pyramid beacons in line 141° mark the line of the cable.

Ships are also prohibited anchorage at less than $\frac{1}{2}$ mile on either side of a line drawn from the northern extreme of Mathieu Reef and Mount Uazangu.

Infernet Channel.—Resuming the passage to the northward from between Deverd Cape and Islet; toward the outer of the two tracks, the 336° course should be continued till Teudie Summit comes on with Tsiba Peak; that line will lead to the entrance of Kendec Channel.

A beacon has been fixed on the detached reef which lies close on the northeast side of the large reef which separates Deverd and Kumak Passages.

Table (Kamak) Islet is wooded similarly to Kendec and stands $7\frac{1}{2}$ miles northwest from it. On its southern end there is a flat-topped hill, which forms an important landmark.

Infernet Rocks are two heads, both lying near the track recommended. The southern one is only 4 yards in extent and perpendicular on all sides; it is covered by 8 feet and is marked by a beacon. The second rock lies about $\frac{1}{2}$ mile 336° from the first; it is about 160 yards in diameter, the least water being $2\frac{1}{2}$ fathoms, with 4 fathoms close round it.

A beacon marks the southwest angle of the central reef, $3\frac{1}{2}$ miles in length, which forms the northeast side of Infernet Channel and separates it from La Fine Channel.

Leleizour Reef lies about $1\frac{1}{2}$ miles north of Table Islet and $1\frac{1}{2}$ miles off the nearest shore. It exposes a small sand islet at low water, but is seen with difficulty when covered by the tide.

Double (Nemu) Islet is a conspicuous object standing in the comparatively open water 6 miles northwest from Table Islet and $2\frac{1}{2}$ miles offshore.

Tidal streams.—Between Kumak Passage and Nehue Bay the flood runs to the southeast and the ebb to the northwest.

Directions.—From the entrance of Kendec Channel, southward of Kumak Passage, Table Islet will be seen a little open west of Kendec, when the course will be toward the center of the Dome (Tiebaghi) Mountain, 2,001 feet in height, through the center of the channel, leaving the beacon on the reef south of Kumak Passage a short distance on the west side. This channel can not be used at low water by a vessel drawing more than 23 feet; those of greater draft should pass out of Deverd Passage, guarding against the $3\frac{1}{2}$ -fathom shoal which lies in it, and reentering by Kumak Passage.

After entering by Kumak Passage or coming from the southward by Kendec Channel, and having passed eastward of Kendec Islet

Reef, the course should be shaped to pass eastward of the beacon on Infernet Rock until the horn on Mount Kumak appears west of Pandop Point. The northern of Infernet Rocks will then be past, and the course will be altered as necessary to pass to the westward of the beacon on the southwest angle of the central reef and then steer for Table Islet, bearing 328° . When the south extremity of Pandop Point comes in a line with Kaala Peak, the course will be 353° , to pass between Table and Magone Islets. From between those islets the course will be 328° , which will lead a short distance west of Leleizour Reef and eastward of Doublet Islet.

La Fine Channel.—This inner track alongshore, which is only practicable by vessels drawing less than 13 feet, commences at the north side of Gomen Bay, between Iuanga Point and the large inner reef which forms the west side of this channel throughout $5\frac{1}{2}$ miles. Vessels should skirt the shore reef at less than $\frac{1}{2}$ mile till between a cluster of coconut trees and the beacon on the reef to the westward at the narrow part of the channel. From that point the course is toward Magone Islet (situated east of Table Islet), and close past the west side of the reef which projects 1 mile to the southeast from Tangadio Islet, marked by a beacon.

The low point of land which lies 336° from Tangadio Islet must be avoided, as a rock covered by 1 fathom lies some distance off; also an isolated reef about 50 yards in diameter, which has two heads nearly awash at low water, lies about 1 mile 291° from that point. To pass westward of these dangers keep the foot of Cape Tonnerre open of Paagumene Point.

Bank.—A bank of sand and gravel, with a depth of $1\frac{1}{2}$ fathoms, is situated between Tangadio Island and Magone Island; it is marked on the southern edge by a black buoy.

Oland Bay is formed by Paagumene Point and Cape Tonnerre; it affords temporary shelter during southeast winds and anchorage may be taken with Paagumene Point bearing about 156° . Sailing ships when in this vicinity during northeast winds must be guarded against the effects of violent squalls which descend from the heights.

Paagumene.—This port, which was opened in 1909 for the shipment of chrome ore, is situated close eastward of Paagumene Point. The anchorage, in a depth of 7 fathoms, is situated $\frac{3}{4}$ mile from the jetty, and is indicated by white beacons.

Small repairs can be effected at the workshop of the Chrome Co. and the services of lighters of 50 tons capacity obtained.

Pilots for Paagumene can be obtained at Noumea.

Communications.—Communication with Noumea and the coast ports is maintained by steamer every fortnight, and there is telephonic communication with Gomen.

Nehue Bay, though large, affords but little good anchoring ground; the best position is to the eastward of the largest of the islets which form a continuation of the north point of Cape Tonnerre and to the northward of a reef which uncovers; the reef is always seen, notwithstanding the turbid state of the water. Shoals extend about $1\frac{1}{2}$ miles distance offshore around the bay.

The entrance from seaward through the reefs is by Gazelle Passage, described hereafter.

There is an unpleasant short sea in the northern part of the bay during the prevailing southeast wind. There is no watering place near the above anchorage.

Gazelle Passage.—From seaward the position of this pass through the barrier reef may be recognized by the high land of Tiebaghi, rounded at the summit in the form of a dome and sloping to the northwest to join the hill Yago, which has two mounds. Tanle Island is of a dark color. The outline shows plainly against the background. Pume Peninsula is high and has a remarkable peak on the west end. Uanne Islet has trees on it. The islands Neba and Yande are also conspicuous.

The position of the vessel having been obtained by cross bearings and the course shaped accordingly toward the entrance, the sand islet Carrey will be seen near the end of the reef on the north side of the passage. The course must then be directed by eye midway between the islet and the great reef on the south side. The depth in the passage is 11 fathoms. If bound northward to Tanle Bay in a sailing vessel, the course should be shaped to pass well to the southward of the rocks (on which there is a small sand island) lying southward of Uanne Islet.

Gazelle Passage is not recommended for large sailing vessels. Nehue Bay lies abreast of it and is probably used by vessels visiting it. There is apparently no difficulty in a steamer with a good lookout.

A shoal with a least depth of $3\frac{1}{2}$ fathoms over it has been reported $3\frac{1}{2}$ miles 192° from Pume Point.

Tanle Bay.—This bay, or port, affords protection against the worst weather, and it is said to be the only place on the northwest coast of New Caledonia where it would be possible for a vessel to withstand the fury of a hurricane. The best position is with the mound on the east end of Tanle Island bearing 179° and Maabunghi Islet (which lies close off the northwest end of Tanle Island) just disappearing behind the northwest point of the latter.

Having arrived off Cape Tonnerre by the inner passage, continue the course about 328° , passing Ti-ae Islet on either side. The north end of Bonnmaame Reef must not be passed closely; that reef forms the south side of the entrance, and at low water a long narrow ridge

of sand may be seen on it. With the prevailing southeast wind a vessel would have to work up to the anchorage on the northwest side of Boh.

Water.—Within Tanle Bay there is a watering place to the eastward of the southern hill of Pume Peninsula, at the entrance of Puani Bay, and vessels may anchor close to the eastward of it. It is a lee shore, and during strong winds from southeastward or south access to the watering place is difficult.

Tides.—It is high water, full and change, in Tanle Bay at 8h. 4m.; springs rise $4\frac{1}{2}$ feet.

Ohope (Crescent) Bay is situated on the west side of Pume Peninsula. It offers excellent protection against the ordinary winds and is easy of access. When approaching from the southward the danger requiring attention is the small reef lying southwest of the southern point of the peninsula, which may be passed on either side. The anchorage is about midway between the points forming the bay, in 7 or 8 fathoms. When the wind is strong from east or northeast heavy squalls come from the high land of Pume into Ohope Bay as well as along the whole west side of the peninsula.

Pume Passage through the barrier reef is $1\frac{1}{2}$ miles wide. The landmarks in this neighborhood part are the following: Pume Peninsula, 1,368 feet high, standing boldly out in the foreground; the peak on its northwest end being pointed is easily distinguished. Neba Island and Yande to the northward can not be mistaken.

Vessels from the westward should bring the peak on the northwest end of Pume to bear 92° and stand in on that line. The same bearing of the peak will lead through the passage, leaving the end of Nenema Reef about 700 yards on the north side. If bound to the northward after entering the passage, the course should be directed toward Mouac Island, in order to pass southward of Lolo Rock, till Paaba Island opens out clear of Neba Island; the course will then be between Neba and Ualauate (Pierced) Rock.

Tide rips.—At the change of tide strong eddies and ripples will be found in the pasasge.

Neba Island.—**Anchorage** will be found suitable for a short stay off the west side of Neba Island, opposite a village and a long beach bordered by coconut trees, in 8 or 9 fathoms, sandy bottom, protected from easterly and southerly winds.

Banare Bay.—This bay extends about 5 miles between the peninsulas Pume and Buabondo, including several small islands, and it offers many excellent anchorages.

• **Mouac Channel.**—A temporary anchorage, as indicated on the chart, may be taken at the west entrance of this channel, in $4\frac{1}{2}$

fathoms, sand, to the northward of Pume Peak, near two small watering places.

Vessels from the southward find access to Buemanda by the Mouac Channel.

Directions—Anchorage.—Vessels from the southward bound to Buemanda use Mouac Channel, keeping in the fairway. Mouac Island Reef is steep-to, but the opposite shore is foul to the distance of 200 yards in places. When entering by this channel they should keep about the middle. With a fresh breeze from southeast those in a sailing ship should look well after the upper sails, on account of the violent squalls which come over the high land of the peninsula; they are the more dangerous as perfect calms frequently intervene.

The best protected and most convenient for communication is that at Buemanda, on the north side of Pume Peninsula and to the eastward of the low point Buemanda, near the village of the same name. The anchor should be let go in about 4 fathoms, sand and mud. The east point of Mouac Islet is in line with the center of Pi-Onne Islet, 297°, and the west extreme of Yeue bears 38°.

Approaching Buemanda village from the northwest, the west sides of Yaba and Paaio Islands should have a wide berth, and also Tu-Aye (a wooded islet with a hillock on the west end), which is foul on the north and east sides, a shoal projecting from the latter beyond the line of reef. Bearings of Tu-Aye, Yeue, and Mouac Islands afford good marks for fixing the course of the vessel to the anchorage between these islands in about 5½ fathoms, sand and mud, avoiding the flat, if necessary, which extends westward of Yeue, or a vessel can proceed southward to the anchorage off Buemanda, above described.

Buabondo.—The north point of Banare Bay offers good shelter from northwest winds. To avoid going too far into the bay and too near the reef, which dries ½ mile from the shore, keep the northwest extreme of Paaio Island open southward of Puragan Rock; on that line the depth of 3 to 3¼ fathoms will be found opposite the center of the bay. In that position there is a rough sea for boating during strong southeast winds.

The approach to that anchorage from the northward is by the channel of the same name, between Paaio Island and the large reef round the south end of Buabondo Peninsula.

There are other anchorages in Benare Bay where protection may be found during southeast winds; for instance, 77° from Yeue, and north of Bai Reef, each in 3¼ fathoms, soft mud, and to the eastward of Nendiale Island in 3¼ to 4 fathoms, mud.

Coast.—**Yengiebane anchorage** is situated about 3½ miles north-eastward of Neba Island. The island is of a dull-red color. Small

vessels may find temporary anchorage off the northwest side, opposite the opening between Yengiebane and the southwest end of Paaba. The space between the two islands is only a boat passage.

Paaba Island.—A vessel may anchor for a short time to the westward of Paaba Village, but should not go within a line formed by a rock off the southwest point of the island and the sharp peak of Pume. There is no bay or place of shelter on the east side of the island.

Taanlo Island, entirely covered with coconut trees, Taanlai Island, which has a hill, the rocks Taaninu and others, Temaghie Island, and lastly Ti-a Islet, the northernmost, are all situated on the reef which extends about 3 miles northward and westward of Paaba Island; the reef is fairly steep-to.

Yande Island lies 6 miles to the westward of Paaba; the arid summit near the northern end is elevated 1,070 feet; it presents a smooth precipice to the east and a gentle slope to the west, where there are inhabitants and plantations. A reef extends from the island toward the west and southwest. The former part of the reef and the high land about the center of the island form a bay, in which there is an anchorage in about 12 fathoms protected from the prevailing southeast wind, but it is necessary to go close inshore to obtain good shelter. The ocean swell is felt at the anchorage continually, and at low water communication with the beach is often difficult.

During southwesterly winds vessels may anchor off the east side of Yande, opposite the middle of the island and a beach bordered by coconut trees. There are numerous coconut plantations on the island.

Yande Passage, between Great Yande Reef and Nenama Reef, is about 1 mile in breadth and lies about 2 miles seaward of Yande Island, the peak of which bearing 44° will lead through.

The reefs on either side upon which the sea breaks extend under water a short distance. The tidal streams are very strong about the middle of the flood and ebb. A sailing vessel should keep rather to the weather side when using the passage.

Directions—Nehue to Belep Islands.—Continuing the inner passage from a position opposite Tanle Island, the course will be toward the southwest point of Pume, in order to sail along that peninsula, leaving on either side the small detached reef off the west point of Tanle Bay. To pass westward of it, keep the west end of Pi-Onne Island open of Pume Point. The latter point may be passed at a short distance; from thence the course will be 341° , to pass westward of the reef around Pi-Onne Island and also to the westward of Pierced Rock (Ualaute). The same course continued will lead to

the westward of the group of islands standing northwest of Paaba Island.

If bound to Belep Island, after passing Pierced Rock, steer about 319° as far as Dao Islets, leaving them on either side.

Those requiring to work to the southward from Yande Island should not stand farther west than Neba Island, in line with the sharp peak on Pume, to avoid the unsurveyed ground westward of it.

To keep eastward of Lolo Rock, which lies nearly 2 miles southward of Neba, do not bring the south point of that island to the eastward of north.

Alliance Reef, upon which the sea generally breaks during south-east winds, lies nearly halfway between Ti-a and Belep Islands; also 8 miles 77° from the southern Dao Islet.

Belep Islands.—The cluster of islands known by this name comprises two large islands—Art and Pott—the small island Nienane, and a number of islets.

Dao Islets, which stand at the southern part of the group, are of sufficient height to be seen from Ti-a and Yande. Three rocks in the form of needles named Three Sisters terminate to the southward the group of South Dao. Nienane Island, situated between North Dao and Art Island, is a high, bare rock.

Art Island, the largest of the group, offers no shelter on the east side, which is moderately bold; there is a shore reef, rather large and plainly seen to the southward of Male Bay; also there is a large reef projecting from the shore at the northeast end of the island. The west side of the island presents three large bays which are accessible to vessels. Peiroma Bay, at the south end of the island, has not been examined. Andiane Bay, at the southwest end of Art Island, is merely a cove, in front of which vessels may anchor in 9 to 11 fathoms.

Uala Bay, near the center of the west side, is nearly a mile wide. Vessels may anchor to the westward of the beach at the inner part of the bay, in 5 to 6 fathoms, on muddy bottom, with the hill on the northwest side bearing 308° . In that position they will be protected from wind between south by east, around by east to northwest by north. A small rivulet is lost among the sands of the bay.

Aue anchorage is formed by the coast receding considerably to the eastward, while it is protected by three coral reefs at a convenient distance on the west side, the two large reefs being separated by a navigable channel. The best position is about $\frac{1}{2}$ mile from the inner part of the bay and 800 yards from the nearest shore to the northeast, in about 10 fathoms, mud, excellent holding ground. It is a good anchorage at all seasons, though open to the northwest and south; there is no guaranty that it would be safe during a hurricane.

In the foul-weather months more shelter would be found relatively, against the rough sea from northwest, by anchoring nearer the southern reef than to the island.

Fresh water of good quality may be procured at all times at the inner part of the bay, where the beach is not fringed with coral.

Pott Island, situated northwest of Art Island, has a small bay on the west side, greatly obstructed by coral rocks. At the southwest part there is anchorage suitable for small craft.

Tides and tidal streams.—In the space between Ti-a and Art Islands the tides are generally earlier than at Noumea. At full and change it is high water $1\frac{1}{2}$ to 2 hours earlier than at Noumea; at neaps it is high water some minutes later; during the intervals the relative change of time is very irregular. The tidal streams are strongest about the extremities of the reefs. The flood stream runs to the southwest and the ebb to the northeast.

Great Yande (French) Reefs extend from Yande Passage about 75 miles to the northwest. The southern portion, about 22 miles in length, is known as the Great Yande Reef, which throughout the greater part of its length is formed of a double row of reefs nearly parallel, separated by a narrow deep channel, strewn with a number of coral heads. From the heights of Yande Island those rocks are plainly seen under the blue water, and the lagoon thus formed is sometimes visited by fishermen.

Little Pass.—A small opening in the reef is found a little to the southward of the parallel of Art Island; it is not recommended.

Estrees Passage is deep and the end of the reef on the south side is very steep. Sand or Dao Balayet Island lies just within the entrance, with a channel on either side; that southward of the island only has been examined, but there is no information concerning it.

One mile inside the passage there is a bank having at least 13 fathoms over it.

North Passage.—At 13 miles northwest from Estrees Passage there is a passage 2 miles wide, divided into three channels, said to be navigable, by two sand banks which are covered at half tide, and are plainly seen from outside. At about $3\frac{1}{2}$ miles 43° from the north side of the passage there lies a reef about 1 mile long southeast and northwest, which dries at low water. It is steep at the southeast end, but a long spit under water extends to the northwest.

The great reef is unbroken from North Passage till near the extremity, where there is a passage only 600 yards wide, formed on the northwest side by an isolated ring or atoll, on which there are three large stones thrown up by the sea; one huge block of coral is more than 13 feet high.

At about 2 miles 291° from that block there is a patch of reef nearly 800 yards in length and less in width, upon which the sea always breaks.

Finally, at 5 miles 313° from the same block and while it is still visible there lies the last part of French Reef, 2 miles long toward northwest; it never uncovers, but is easily seen by the sea breaking violently over it. From that reef another trends 2 miles to the northward.

Caution.—Mariners are cautioned that the New Caledonia Reefs northward of latitude $19^{\circ} 30' S.$ are very imperfectly charted, and should exercise every care when in that neighborhood.

CHAPTER VI.

NEW CALEDONIA—SOUTHEAST COAST—HAVANNAH PASSAGE TO KANALA BAY.

Southeast coast—Northward from Havannah Passage—Directions.—If desirous of running along the southeast coast of the island, on leaving Havannah Passage bring Kie Island to bear 201° and so kept, bysteering in the opposite direction till Kuebuni and the shoal extending 1,350 yards east of Nau Island have been passed, when the course will be 331° midway between and parallel to the outer reefs and the shore. On the lowland of Cape Puareti there are two clumps of fir trees.

If it be desired to reach one of the eastern ports by passing outside the reefs, Kie Island should (on clearing the passage) be kept bearing 190° , which line will lead between Coetlogon Bank and the great sunken reef which trends parallel with the coast northward of Nau Island.

Coetlogon Bank is described elsewhere.

Kuebuni is the next opening in the reef to the northward of Port Goro and Havannah Passage; it is only fit for very small craft which may be stopped by a head wind and bad weather.

At about $\frac{3}{4}$ mile northeast from Kuebuni Passage and about $\frac{1}{2}$ mile east from Nau Island there is a $2\frac{1}{2}$ -fathom patch. The sea only breaks on it in rough weather and then at intervals. The clearing marks are Tæmo Islet open of the east point of Nea Island, until the north point of Nea is touching the south end of Nau. A sunken ledge joins the patch with the north part of Nau Island.

When 2 miles north of Kuebuni the shore should not be approached within 1 mile in consequence of some heads of coral being scattered at a distance off the shore reef. At 3 miles southeast of Yate there is a projection of the reef to seaward; it is steep-to and the northern part forms a cove in which a very small craft might find temporary shelter. Between that projection and Yate the shore reef is very narrow.

Tidal streams.—Off the southeast end of New Caledonia the ebb sets from east by south to east-southeast. During light winds a sailing vessel in the inner channel might be set upon the outer chain of reefs, if not guarded against.

Port Yate.—The coast between Kuebuni and Unia (a distance of 18 miles) only presents one important opening, the narrow and deep valley which forms Port Yate, which is nothing more than the mouth of a moderately large stream. The position is best known from a distance by the conical summit of Guemba, which stands $1\frac{1}{2}$ miles to the southward of the port and is 1,938 feet high. That is a greater altitude than any other mountain in the vicinity.

The space between the shores appears large, but it is narrowed by the reefs on each side, rendering the navigation difficult, especially as the water is often too turbid to allow the bottom to be seen.

A beacon has been placed on the extremity of the shoal which contracts the channel on the north side. It stands on a rock covered by 3 feet at low water. Vessels should pass about 100 yards to the southward of the beacon in 4 fathoms.

The critical navigation renders the place objectionable even to small sailing vessels, except under absolute necessity.

Sailing vessels can only leave Yate with the morning wind, between 4 and 7. That wind is sometimes very fresh in the river but diminishes considerably on entering the bay and almost ceases on reaching the open water, so that vessels are frequently obliged to employ their boats to tow them out.

Off-lying reef.—From the south point of the outer reef 44° of Kuebuni and $2\frac{3}{4}$ miles offshore, the chain of reefs is entirely under water. Though it is probable that a less depth than 3 fathoms does not exist, no vessel should attempt to pass over them without absolute necessity; the swell over them is extremely hollow and sometimes during bad weather from the eastward the sea breaks over the entire length of the reef.

The next portion of the great outer reef commences at Yate Patch, a dangerous bank of coral on the north side of Yate passage, bearing 55° nearly 4 miles from the entrance to the port. Though there is very little water over it the sea seldom breaks during fine weather. From that patch the reef extends in a northwest direction about 4 miles, being composed of numerous shallow heads of coral separated by narrow spaces of deep water.

Yate Passage is a break in the sunken reef about 4 miles north-eastward of the port. The leading mark through the center of the channel is Guemba summit bearing 235° , which leads nearly a mile southward of Yate Patch; depth not given.

A passage with 8 fathoms is shown on the chart, with Nenu Island bearing 237° .

Unia Passage has a depth of 27 fathoms, but outside the passage in the offing there are reported to be some scattered heads of coral with from 6 to 8 fathoms over them, perhaps less, on which a moderately heavy sea breaks. Besides those rocks, there is within the

line of reefs, in the blue water, a sunken ridge with 4 fathoms over it; for that reason Unia Passage is not recommended.

From Yate to Unia there is no possibility of anchoring between the barrier reef and the shore reef. The sea there is frequently very rough, the bottom is hard rock, and the depth about 30 fathoms.

Wreck.—The wreck of the sailing vessel *Rochambeau* is situated on the barrier reef, at $4\frac{1}{2}$ miles east-northeastward of Unia.

This wreck forms a useful mark for vessels making Unia Passage.

Coast.—**Mamie** is the opening in the shore reef situated $2\frac{1}{2}$ miles 123° from Unia, and to the northward of the valley which is traversed by the Mamie River. The position is marked by fir trees and some clusters of coconut trees. As a cove it is capable of sheltering large coasting vessels. The north side is inhabited and cultivated; some provisions and fruits are procurable.

Port Unia.—About $2\frac{1}{2}$ miles westward from Mamie and close westward of Cape Coronation, the low land which forms the coast trends abruptly to the southwest and forms a bay. Two small streams discharge into it from deep valleys close together.

A reef awash and $\frac{3}{4}$ mile long, steep-to on the land side but less so at the ends, incloses the bay on the sea side. Near each extremity of that reef stands a bowlder; a cluster of coconut trees on the eastern point of the bay also aid to distinguish the place.

The east and southeast sides of this bay are lined with reefs. To the southwest of the anchorage there is a small rock covered by $1\frac{1}{2}$ fathoms water, and just within the eastern entrance there is another with less than 4 fathoms over it; also one with $6\frac{1}{2}$ fathoms. At 600 or 800 yards from the west side of the inclosing reef there are patches with from 5 to 3 fathoms over them.

The best anchorage is about the center of the space inclosed by the reef in 12 fathoms, mud, good holding ground. The sea will not be felt here except with the wind from northwest or west; the sea from northeast is completely broken before reaching the anchorage.

Water of good quality may be procured at the east side of the port.

Landmark.—About halfway between Unia and Puriua a black rock, 80 feet high, stands close to the shore. It may be useful as a landmark whereby to clear the reefs to the northwest of Unia when the sun prevents their being seen.

Little Passage, through the barrier reef, bears 60° , distant 6 miles from the north slope of To-Ndu Point. The bearing of the point reversed will lead nearly at right angles through the opening, which is 670 yards wide and in depth varies between 15 and 26 fathoms; the latter depth will be found in the track indicated. The reefs on either side are plainly seen from the masthead and are steep-to.

Uinne Passage, 2 miles northwest of Little Passage, is 1,300 yards wide. Kuakue Point bearing 266° will lead directly through the channel over a depth of 27 fathoms. At $\frac{1}{2}$ mile from the outer part of the entrance there is a rock covered by $2\frac{1}{2}$ fathoms, and after it has been left on the south side the course may be altered to the direction required.

Kuakue Passage.—The width of this passage is about 1,400 yards. The leading mark through the center is To-Ndu Point on with a very sharp-pointed summit bearing 190° or the extreme of the north point of Uinne Bay on with a large red patch of slight elevation, on the south side of the same bay bearing 218° . The soundings in the passage are irregular, between 30 and 46 fathoms, with a patch of $3\frac{1}{2}$ fathoms north of the marks given.

Northwest of this passage the inner part of the outer reef presents many deep openings, which must be avoided as they are entirely barred by the outer ridge.

Coast—Uinne (Recontre) Bay.—The salient Point To-Ndu, which forms the southeast extremity of the bay, is a good landmark. At 550 yards 291° from the point lies a sunken rock. On the west side of the same point there is a cove nearly 500 yards wide, where anchorage may be found near the center in 19 fathoms, mud, good holding ground. Shelter from southeast winds and sea will be found farther in, with the extreme point of the entrance bearing 32° , in 17 fathoms, 200 yards from the reef.

Notwithstanding the above good points, those desiring to remain during the night are advised to go to Kuakue in preference, which can be done during an obscure night after recognizing To-Ndu Point.

On going to the inner part of Uinne Bay it is necessary to guard against two sunken rocks near the shore on each side on which the sea does not always break, and it is desirable to keep over toward the small stream on the south side, as there is a bank of sand and mud opposite the mouth of the large stream with 1 fathom over it. When free from the reefs the depth is too great in the outer part of the bay; in the west part the bottom is mud, good holding ground, and the depth diminishes gradually from 22 to $4\frac{1}{2}$ fathoms.

Uinne Bay is open to wind and sea from northeast and east. It is sometimes difficult for a sailing ship to leave it in consequence of the calms or eddy winds occasioned by the high land.

La Fine Bank.—At a little over 1,400 yards 47° from the first hill over the northeast point of Kuakue Bay there is a bank on which a depth of $5\frac{1}{2}$ fathoms was found. Also about 2,200 yards 44° from the same hill there is a patch with less than 8 fathoms over it.

Kuakue Bay.—The east point is high and steep-too and there is excellent holding ground under its lee. The projection of a small wooded bluff with a black cliff marks a division in the bay. In the

southeast part during easterly winds the water is smooth, as the swell is never felt there, though at such times it is always heavy in the northwest part of the bay and often it is so on the east side of the bluff.

The anchorage in the southeast angle is 1,200 yards wide and the bottom is mud, excellent holding ground. At the inner part of this cove there are depths of 10 to 13 fathoms over rocky bottom.

Cafards Reefs.—These beds of rock lie northward of Kuakue and to the eastward of Porcupine Island. The southern patch is covered by $3\frac{1}{2}$ fathoms and the northern one by $1\frac{1}{2}$ fathoms. Their positions will be best seen on the chart.

It often happens after heavy rain that the shoals nearest the shore can not be seen, therefore bearings of points on the adjacent shore will be valuable guides. The patch which is farthest north, with $5\frac{1}{2}$ fathoms over it, is circular, of small extent, and white, therefore can be seen. The eastern shoal is black and is seen with difficulty; but, having 8 fathoms over it, there is nothing to fear.

Porcupine Island.—This small island is connected with the mainland by an isthmus of sand, which is covered at high water. Its northeast part is 300 feet high, very steep on the sea side, and covered with fir trees. The east end of the island is continued by a bed of coral which is always above water, and on it stands a sharp-pointed rock 60 to 66 feet high.

A temporary anchorage may be found under the lee of this island during westerly winds in 11 fathoms mud, but it is not recommended on account of a 1-fathom patch, which the discolored state of the water frequently renders invisible, also the swell beats constantly on the reefs and rocks which surround the coast, rendering landing impracticable.

The coast.—Between Porcupine Island and N'Goe anchorage, 11 miles northwestward, the coast, not being well protected by the barrier reef, is constantly beaten by the sea and generally unapproachable. The arid mountains in many places reach the sea by steep declivities. The shore reef is rather narrow and steep-to throughout the first 2 miles, beyond which it is protected by a coral reef which extends 400 yards from the shore till abreast a patch on which the sea breaks, situated on a bed of sunken rocks extending 1,400 yards offshore, named Kamere apparently, southeastward of which nearly a mile is a sunken patch on the chart. To the southward of these patches there are two mouths of a considerable stream which traverses a long valley; country boats only can enter it. The island formed by those two branches of the river is covered with fir trees.

Beyond the above projecting reef the shore again becomes steep-to till within a mile of a semicircular bay which precedes N'Goe; there the shore reef projects considerably and the sea always breaks on it. To the southeast of the outer part of that reef there is a

detached head always covered, but visible. The bay mentioned above (southeast of N'Goe) is open to the sea and covered by patches of rock; it receives the river Ngone, the bed of which is the best and shortest track whereby to reach the summit of Mount Humboldt.

Aiguille Rock, with 1 fathom over it, lies $1\frac{1}{2}$ miles southeast of N'Goe Reef. Mamere Islet bearing 308° leads about 1,600 yards castward of the rock.

Solitary Passages.—These two passages through the outer reef are abreast the part of the coast just described. That to the south-east is the best opening in the reef throughout the east coast. An isolated bed of rock 1,300 yards in length north and south, on which the sea always breaks, separates these two passages, and may be distinguished from some distance by the solitary or detached position of the breakers, also by a small rock which never covers on the southwest edge. It is the only rock on the great reef seen above water between the little islet to the southward of Unia Passage and Nileuti opposite Tchio, 24 miles farther northwest.

Southeast Passage.—The west side of Solitary Reef is moderately steep; the east side throws out two branches under water; the southern one forms the northwest or lee side of the southeast Solitary Passage, which is about 2 miles wide and is deep, about 30 fathoms. Mount Humboldt bearing about 252° leads through the fairway.

Northwest Passage is 1,500 yards wide, and deep. The leading mark through the center is the summit of Mount Humboldt bearing about 243° .

Pavee Passage is so named in consequence of two rocks; one of them near the center has 2 fathoms over it, and many other detached patches lie without on the eastern side. The entire width of the passage is 1.2 miles, and is separated from east N'Goe Passage by a large reef, which is rendered dangerous by the sea side being much lower than the land side, consequently the sea generally breaks on the inner side only.

East N'Goe Passage is 1,750 yards wide, with a depth of 30 to 33 fathoms. The leading mark through the center is the small wooded island Uemie bearing 238° . The part of the reef which borders the passage is covered by 10 to 30 feet of water, with holes some 20 fathoms deep. It is scarcely visible except from the masthead.

North N'Goe Passage.—Between this passage and the preceding the Buende Reef trends northwest nearly 5 miles. That reef is not steep-to, especially at the southeast end, but the sea breaks over a considerable extent. The passage is only 900 yards wide between

the sunken edges of the reefs. Bottom was not found with 65 fathoms of line close outside. Sinde Islet bearing 176° will lead through the center.

Landmarks.—About this part the mountains near the coast are of moderate elevation and have patches of red earth showing between the trees, but present no other remarkable feature. A little beyond Tchio and about 2 miles from the coast will be seen a fantastically shaped mountain named Dent or la Corne.

N'Goe anchorage is protected by a large reef of the same name, but although the reef is on a level with the water it does not prevent a high sea getting up directly the wind becomes at all fresh. The water being always more or less discolored, the dangerous shoals in the road are seen with difficulty.

Uemie and Mamere Islets lie between N'Goe Eastern Passage and the shore. A sunken rock lies northwestward of Uemie and another south of Mamere.

Sinde Islet and Mendigue Reef lie on the same flat, which is about 2 miles in extent and with many shallow patches on it, as charted. It lies northward of Uemie and between the two N'Goe Passages. At $\frac{1}{2}$ mile northwest from Sinde Islet lies Mendigue Reef.

Mamere Channel.—A deep muddy channel, known as Mamere, separates Sinde Islet Flat from the coast. Vessels having a fair wind should always take that channel in preference to going outside, which has not been so well surveyed and in which dangers may exist.

Beacon.—On the coral reef at the west extremity of Sinde Islet Flat and the northeast side of Mamere Channel stands an iron beacon surmounted by a ball.

Directions.—On approaching Mamere Islet a cluster of fir trees will be seen at Netue, standing near the foot of the mountains; on passing the northeast end of N'Goe Reef those trees should be brought to bear 280° and steered for, passing southward of Mamere, till Sinde Islet appears to the northward of Mamere, when the course should be altered nearly six points to starboard, direct for the outer point of Tupeti. That track will be very close to Mamere and between it and the rock charted south of it. When Sinde Islet bears 89° the course may be altered to give Tupeti Islet Reef a prudent berth.

If it be desirable to avoid the sharp turn to be made when passing between N'Goe Reef and Mamere, the course may be shaped so as to pass 800 or 1,000 yards to the eastward of Mamere; that is, between the islet and the small shoals to the eastward of it. As soon as the solitary fir tree situated on the north side of Coetlogon Cove is seen slightly open of the south point of the same cove and bearing 292° the course should be toward it in order to join the former track.

All the dangers projecting from the reef to the southwest of Sinda Islet will be avoided by keeping Porcupine Islet (west side of Kuakue Bay) in a line with Mamere Islet astern.

Eastward of Sinda.—Between those outer islets and the great reef there is sufficient space for a vessel to work to windward against a southeast wind, over depths of 22 to 27 fathoms, keeping a good lookout for uncharted dangers.

Tidal streams.—Within the barrier reefs the stream of flood sets to the northwest with increased strength during southeast winds. Sometimes it attains a velocity of 3 miles an hour, but it is always feeble in Mamere Channel.

Coetlogon Cove is open to wind and sea from the eastward, but the holding ground is good. A fir tree on the beach at the inner part of cove serves as a landmark and guide for the anchorage in the middle:

Tupeti Island forms a remarkable feature and landmark, projecting apparently from the coast line; it is 1,132 feet in height, and when seen from seaward its dark color and pyramidal form distinguish it plainly from the high mountains behind. The east side is very steep and covered by a considerable number of fir trees, which grow at right angles with the sloping ground instead of shooting up vertically as usual in such positions. This island forms the southeast limit of Port Bouquet.

Tupeti Passage is about 6 miles 314° from North N'Goe Passage, being separated by three reefs which partially uncover and always show breakers. It would be imprudent to attempt to pass through any of the openings which occur in those 6 miles.

The vicinity of Nileuti Islet on the outer reef northward of the passage renders the recognition of this, as well as Tchio Passage, very easy; it is the only wooded islet on the reef near this part. In the center of this passage there is a coral reef with 3 fathoms over it, which may be avoided by keeping close to the reef on the southern or weather side, on which the sea always breaks, and by bringing the extreme east point of Nemmeni Peninsula to bear 209° . That point may be known by its bright red tint contrasting with the land behind.

When following that track care must be taken to avoid the northwest tail of Niauato Reef (which forms the south side of the passage) and extends a distance under water. If bound to Tupeti, the course may be direct for the summit of that island as soon as the outer reefs are cleared.

Cerciat Rock.—A coral patch about 20 feet in diameter, with a depth of $2\frac{1}{2}$ fathoms, is situated with Kinde Island east extreme bearing 241° , distant 1.8 miles.

Port Bouquet.—This space, which is nearly 6 miles in length, is inclosed by Tupeti Island and Nemmeni Peninsula at either end, with Nenu Island and a large reef on the northeast side. It is accessible by three channels. Sailing vessels should not take the central passage. The northwest passage is the largest, being $\frac{1}{2}$ mile wide and 10 to 20 fathoms deep. The best guide is a bearing of the west end of Nenu or the wooded rock to the westward of it. The latter bearing 184° will lead through the center.

Shoal.—A shoal of $1\frac{1}{2}$ fathoms is situated 700 yards 207° of the wooded rock westward of Nenu Island.

Buoy.—A black and red horizontally striped barrel buoy has been established to mark this shoal.

Anchorage.—Vessels may anchor in any part where there is room to swing clear of the coral rocks which line the shore; but Nemmeni Cove at the west end is difficult of access; it has many patches of coral, and in the absence of buoys is only safe for those acquainted with it.

The best positions are as follows: First, in the central part of the bay on the northwest side of Tupeti, in 13 or 14 fathoms, moderately good holding ground; with the north point of Tupeti 21° and the east point of Nenu Island in a line with the distant land about Nekete and Kanala. Second, with the northwest point of Tupeti bearing 52° in 11 fathoms, moderately good holding ground; about 600 yards offshore. But this eastern part of Port Bouquet has many coral heads $\frac{1}{2}$ mile out. Third, in Nenu Bay, on the north side of Nenu Island, in 16 fathoms, mud, with the low isthmus connecting the higher parts of that island on with Iemia Peak, which is southwest of Tupeti. Fourth, to the southwest of the east end of Nemmeni Peninsula, with the southwest points of Nenu and Tupeti Islands in a line; depth 16 fathoms, over red mud, excellent holding ground.

Water.—Within this port there are two excellent watering places, one at the inner part of Tupeti Bay, 600 or 800 yards 123° from the first anchorage; the other at the inner part of Nemmeni Cove, where the river of the same name discharges. The To-Ndu River, which flows into the southwest side of Port Bouquet, is not accessible by large boats at low water.

Islets.—**Kinde Islet** stands on a coral reef to the northward of Nemmeni Peninsula, and has some trees on it. Numerous heads of coral are situated round the islet; those farthest south have between 3 and 4 fathoms over them, and are quite in the track of vessels. The west extreme of Caledonienne Shoal, nearly awash, lies $1\frac{1}{2}$ miles 300° from Kinde Islet.

Tchio Passage is comprised between the sunken ledge with detached heads extending northwest from the wooded islet Nileuti on one side and the isolated detached heads to the southeast of Trois-Bras or Domangue Reef on the other. It is a little less than 1 mile broad. A shoal with $1\frac{1}{2}$ fathoms water over it extends into the pass for $\frac{1}{2}$ mile 111° from the south end of Trois-Bras Reef and close to the track which vessels take on entering.

Directions.—The black rock Buatamere, on the coast off Tchio Valley, is the best landmark by which to know the passage, and when bearing 220° will lead through in the fairway. The same mark will lead into the anchorage westward of the black buoy, but the rock bearing 210° will lead through the center of the fairway between the buoy and Nuimbua Islet. There are channels through the broken reefs eastward of the buoy available with local knowledge by small craft.

Pilots are obtainable by making the usual signal in the offing.

Tchio Valley and River—Aspect.—The valley is an object more easily recognized than any other on the coast, on account of the height of the mountains at the side, the singular depression presented northeastward, and by Buatamere Rock. That great rock appears black, and it has two sharp peaks; one of them is very high and covered with trees.

One branch of the river flows at the foot of Buatamere Rock and filters across an uninterrupted sandy beach, which connects the rock with the shore. Another and more important branch of the river discharges to the northwest of the rock, but the mouth is obstructed by large sand banks. At 1 mile farther there is the mouth of a third stream, but it is not known if these streams come from the same river; their banks are cultivated by the natives.

A little farther to the northwest Mount Kundi will be seen standing near the shore. It is high and rendered remarkable by large white patches on the side facing the sea. It is connected with Mount Den, about $2\frac{1}{2}$ miles to the westward, and that also forms part of the high chain which extends along the shore as far as Nekete Bay. A vast bed of ferruginous sand crowns the summits of these hills, which it is unsafe to traverse.

Tchio Road lies abreast Tchio Passage, and there is no difficulty in reaching it. The roadstead is partly protected by the chain of reefs extending northwestward for about 5 miles from Nemmeni Peninsula and parallel to the shore, through which there are passages in places used by those acquainted with them.

Buoy.—A buoy painted black marks a shoal situated about 800 yards northwestward of the reefs just mentioned, with Tchio Church bearing 220° , distant 2.1 miles.

Nuimbua Islet—Shoals.—This low wooded islet forms the northwest side of the approach to Tchio Road. It stands about 2 miles 66° of Kundi Peak and a similar distance 10° of Buatamere Rock. It is surrounded by a reef which extends some distance under water to the northwest.

A head of coral with $3\frac{1}{2}$ fathoms over it lies about $\frac{1}{2}$ mile 44° from the islet, and a rock, nearly awash, $\frac{1}{4}$ mile beyond, not far from the track of vessels when making the inner passage. Also a rock, with 4 fathoms over it, lies about $1\frac{1}{2}$ miles 353° from Nuimbua.

Sunken rocks extend about 670 yards offshore under Mount Kundi, westward of Nuimbua Islet.

Anchorage.—The fairway to the anchorage is, between Nuimbua Islet and the black buoy, $1\frac{1}{2}$ miles wide. Buatamere Rock bearing from 220° to 210° will lead through clear of danger. There is good holding ground in from 8 to 12 fathoms about $\frac{1}{2}$ mile offshore, with the church bearing 240° about 1 mile for the greater depth. There is a patch of $2\frac{1}{2}$ fathoms about midway between this position and Buatamere Rock or $\frac{1}{2}$ mile from the rock.

This anchorage is exposed to north and easterly winds, which interfere with vessels loading, at which time there would be more shelter under the lee of the reefs.

Customhouse.—Tchio is the only port on the east coast which has a customhouse and a pilot station, and it is not necessary to proceed first to Noumea for the purpose of entry and clearance.

Kinde Reef lies $6\frac{1}{2}$ miles northwestward of Tchio, in the inner channel. Vessels may beat through between Goun Islet and the long reef Kinde, which is composed of three heads of rock in the form of a horseshoe and uncovers at low water. A sunken ridge extends $\frac{1}{2}$ mile southward of the eastern patch. Unless surprised by a calm on the approach of night, vessels should avoid anchoring off the open coast in this part of New Caledonia.

Tidal streams.—The flood runs to the northwest and the ebb to the southeast in the inner channel near Kinde Reef.

Nekete and Lavaissiere Bays.—Nekete Bay is open to winds from the northward and eastward. The best anchorage is with the mouth of Puemata Rivulet bearing 156° and about 600 yards off the nearest shore in 14 fathoms.

The Mela Uankue River, which falls into the southwest part of the bay, has a charted depth of about 3 feet water in the entrance and is said to be available for vessels under 8 feet draft at high water. It is deeper within the bar. A fresh wind from northeast causes the sea to break on the bar at a distance of 600 or 800 yards from the mouth of the river. Many huts were seen on both banks and considerable cultivation.

Nani Island, which separates the two bays, has a boat passage between it and the shore. The entrance to Lavaissiere Bay offers no difficulty, but with the usual southeast wind, often veering to south-southeast, a sailing ship should pass close to the reef on the weather side, while guarding against a small detached rock, rather within and close to the extreme point of the reef; she should also hug the wind as soon as possible after passing that rock in the endeavor to reach the anchorage in the southeast part of the bay on the same tack. The best position is to the northwest of a small sandy beach at the southwest end of which there is a rivulet. The bottom is nearly all coral and the soundings are irregular. In the western part of the bay there are several blocks of coral having from 5 to 7 fathoms over them. The water in Lavaissiere Bay is smooth during all weathers on account of its narrow entrance. For reefs in the approach, see the plan.

Bogota Reefs and Lagoon.—A peninsula separates Nekete from Kanala Bay, the coast of which is protected on the east side by a line of reefs completely uncovered at low water. They inclose a space 5 miles long with a mean breadth of 1 mile; it is deep. The side of the peninsula thus inclosed presents a series of coves, each affording good shelter to small craft. Koh Cove is obstructed by a rock with 1 fathom water. It is separated from Paano (the next cove to the northwest) by a reef projecting from the shore and having a large mass of black rock on it. Numerous heads of coral are scattered over Paano Cove. Toho, still farther northwest, is recommendable for the excellent quality of the bottom, a description of red clay into which the anchor sinks entirely. A sandy beach forms the inner part of each of these small bays, bordered by coconut trees. The district is more populous than other parts, it being the ancient market of Kanala.

The reefs which inclose that lagoon are steep-to on the outside, so that an anchor will not prevent a vessel from drifting on them after missing stays. The northwest entrance is nearly blocked by a reef extending from the western shore, Bogota Point, but there is a depth of 5 fathoms over the ridge just eastward of the 2½-fathom patch charted. The channel west of it should not be taken. A good lookout from the masthead is necessary.

Landmarks—Aspect.—Within a stretch of 33 miles will be seen several remarkable objects—Tupèti Island, Buatamere Rock, Mount Kundi, the conical island Nani, the peak Mara, the mass of mountains which separate Nekete from Kanala Bay, terminating at Cape Dumoulin (Melasceu), which is nearly semicircular, low, thickly covered with trees, and a rivulet flows through them. Bogota Point presents a long conspicuous cliff. In the background will be seen the lofty summits Kanala and Nakada. The latter is rather round

and rendered remarkable by a peak projecting from the left slope. Behind Nani Island there is a hill 1,880 feet high, having a long narrow red stripe; also to the northward of Meunh Peninsula there is a remarkable white patch, which will appear to the right of Nani. It is necessary to avoid mistaking Nani Island for the small peninsula close to the northward of Toho Cove with which it has some resemblance when viewed from seaward.

Nekete Passage, in the barrier reef, lies between the reefs Uakata Nekete on the southeast and Uneneua on the northwest. The summit of Nani Island bearing 219° will lead to it. A good lookout from aloft is necessary, as the passage is narrow. A ledge extends from the southeast side having 3 to 4 fathoms over it close to the track which a vessel must pass. It may be avoided by keeping the summit of Nani Island in a line with the mountain behind it which has a red stripe on it, but the eye should be the guide here.

Kanala Passage.—Beyond Uneneua Reef, which forms the northwest side of Nekete Passage as far as Kanala Passage, there is a series of reefs and shoals among which it is not prudent to enter. In the center of the passage there is a patch of $2\frac{1}{2}$ fathoms, for which no marks are given.

Kanala Passage is useful principally to those leaving Kanala Bay and being desirous to reach the open sea quickly. To a sailing vessel from sea to Kanala it offers no advantage, as with the usual southeast trade wind she would be obliged to work to windward. The Nekete Passage, or any other farther south, would be preferable.

Kanala Bay is on the west side of the lofty peninsula above described. It is about 6 miles in length, north and south, and 1 mile wide in the entrance, opening out within to a breadth of nearly 4 miles.

It offers several secure anchorages in the several smaller bays, according to the wind. For other shoals see the plan.

Ana Reef.—This bed of coral lies $2\frac{1}{2}$ miles 336° from Cape Dumoulin in the approach to Kanala Bay; it uncovers at low water, but during high tide in calm weather it is scarcely discernible. About 179° from Ana Reef there are two detached shoals, the northern one having 5 fathoms over it and the southern one $2\frac{1}{2}$ fathoms. Laurent Reefs lie 4 miles eastward of Ana Reef.

On entering with a strong easterly wind violent squalls may be expected, succeeded by long periods of dead calm, during which a sailing vessel will lose steerageway; it is therefore prudent to furl the upper sails.

Anchorage may be taken in any part of the bay, but if it be desirable to communicate with the French establishment at Kanala (Napoléonville), Port d'Urville should be chosen, or still nearer will be

the position 32° from the Pic des Morts, in 8 or 9 fathoms, mud, distant from the peak 1,350 yards and from the shore in that direction 800 yards. The peak is 804 feet in height and stands at the inner or southern part of the bay and is covered with trees.

Port Duperre, on the west side of the bay, affords anchorage in 11 to 13 fathoms on a line joining Duperre Peak with the projecting point 212° of it, but they should not go beyond that line, as the inner part is obstructed by heads of coral.

Kanala (Napoleonville).—Communication with the station is difficult at low water. It is necessary to go close to the reef adjoining the small rock which stands at the foot of Pic des Morts and land at the stage at Quatre-Bras, thence on foot by a wet path through the mangrove. Boats above the smallest size can not clear the passage at Pic des Morts at extreme low water; they must then go around the bank to the eastward and take the channel between Adam Islet and the shore in order to reach the wharf at Quatre-Bras.

Telegraph.—There is a telegraph station at Kanala settlement.

Rivers.—Two separate rivers flow over extensive flats into the head of Kanala Bay. The Kanala River is at the southeast angle; its source is in the great chain of mountains in the interior, behind an elevated plain, from whence it falls in a magnificent cascade, which can be seen from the anchorage; it then waters the Gelima Valley. The Nekopu River to the westward is of some importance. It waters the fertile Kake Valley and ultimately falls at the foot of Pic des Morts which it flows around on the south side; but that mouth is closed by a bank of sand, which is nearly dry at low water, and only allows moderate sized boats to enter at high tide. Though the depth within the bar increases, it is necessary to know the channel, by which boats can ascend as far as Nekopu village, situated on the right bank of the river about 4 miles from the mouth.

CHAPTER VII.

NEW CALEDONIA—NORTHEAST COAST—CAPE BEGAT TO D'ENTRECASTEAUX REEFS.

The coast.—The west side of the approach to Kanala Bay is free from any known detached shoals, and may be approached at a mean distance of $\frac{1}{2}$ mile. The northern termination of that shore is at Mara, a remarkable peak 820 feet high; from it the ridge of high land trends to the westward and terminates at Cape Begat, which is the eastern point of Laugier Bay. That point may be passed at a short distance as the shore reef is steep-to.

Kuaua Passage, abreast Kuaua Bay, distant about 6 miles, has only a clear $\frac{1}{2}$ mile in width, and the position is not considered good for the landfall. Maria Peak bearing 193° will lead through. The stream of flood runs along the inner side of the reef on the east side and sets to the northwest.

Laugier Bay.—This bay is close westward of Cape Begat. It is deep and safe. The possession of the plan renders much description unnecessary. The west side is high and steep, the coast reef is narrow through a space of 1 mile from the entrance; the last $\frac{1}{2}$ mile at the inner part is narrow and foul. The anchorage is about $1\frac{1}{4}$ miles 179° from Cape Begat, with the west point of the bay bearing between 291° and 314° in about 15 fathoms, mud, good holding ground. There is good shelter from easterly winds.

Kuaua Bay.—The highland which separates this bay from Laugier presents a straight steep coast of about 1 mile. Beyond the fringing reef the coast is free from danger and anchorage will be found on an emergency in about 16 fathoms, mud, excellent holding ground.

Vessels likely to remain a long time will find the most sheltered anchorage in the harbor at 650 yards, 167° from the second point on the east side, in 8 fathoms, mud. Two rocks lie within 700 yards, 224° from the northeast point of the outer entrance, with only $1\frac{1}{2}$ fathoms over each of them. The extremity of Cape Begat open of the north point of the land off which they lie leads northwest of them. All the inner part of the harbor is very foul.

On leaving Kuaua Bay by the channel between the land to the westward of it and Gravel Cay the reefs off Kuea Bay should be

approached in preference to the large reef on which the cay stands, to avoid the shoal which extends 670 yards southwest of it.

Telegraph.—There is a telegraph station at Kuana.

Kuea Bay.—Measuring from the reefs which protrude 800 yards on each side of the entrance, this bay is nearly 1 mile in length toward the southwest and it is $\frac{3}{4}$ mile wide between the points, with a clear entrance between the reefs nearly 800 yards wide. The inner parts on the eastern and western sides are very shallow. This is not a good anchorage, but the least objectionable position will be found with the extreme of Cape Begat open slightly to the northward of the wooded rock which stands on the reef, close to the east point of the entrance, bearing 94° . A vessel would there be exposed to the sea from northeast to north by west, but it is not advisable in a sailing vessel to go farther in.

Kua Cove, which is close to the northwest of Kuea Bay, can only be used by coasting vessels and other small craft. The shoal in the bay with 1 fathom over it is rather large and often invisible, but it is marked on its southeast side by a conical black buoy. A boat can go into the Kua River and at high tide procure fresh water at a cascade a considerable distance up.

The beach of Kua Cove terminates to the northwest at a slightly projecting point, and is that far without a fringing reef; from thence the coast is high and steep as far as Cape Kua, and bordered by a narrow reef.

Cape Kua may be known from the southeast by the prominent angle it forms in the coast line and by a rock in the form of a sugar loaf 118 feet high, the extreme point appearing a little outside the sloping cliffs of the cape, which attain the height of 288 feet.

Two dangerous shoals lie eastward of Cape Kua, at 2 and 3 miles, respectively, with $1\frac{1}{2}$ and 1 fathom over them. The summit of Cape Bocage (5 miles to the northwest of Cape Kua) on with or open westward of Neni Islet leads southward of the shoals, or the islet slightly to the right of the summits.

Many other shoal patches lie to the northeast and northwest of Cape Kua at distance of 2 and 3 miles. The center of the entrance to Ba Bay in line with Neni Islet leads southward of them.

Buru Bays approach.—**Cape Three Pines**, the eastern extreme of Buru Bays, is a very salient round black rock or hill, 160 feet high, with three conspicuous pine trees on the southern ridge, and is connected with the land behind by an isthmus 40 to 50 feet high, covered with ironwood. Cape Three Pines also marks the termination of a sandy beach which extends from Uailu Head.

A reef, 300 yards in length and 200 yards wide, with $1\frac{1}{2}$ fathoms over it, lies about 1,400 yards 331° from Cape Three Pines. Neni

Islet in line with the summit of Cape Bocage leads northward of it. A cylindrical buoy marks the shoal.

Water.—At a short distance southeast of Cape Three Pines a small cascade will be seen, where an abundant flow of water falls into the sea from a height of about 20 feet. A vessel may procure water there easily in fine weather.

Neni Islet, situated 4 miles 314° of Cape Three Pines, is low and covered with coconut trees, and in the center there are three tall pine trees. On the west side of the reef there is a small sand cay which can only be seen at a short distance. A sunken reef lies about $\frac{1}{2}$ mile westward of Neni Islet and its reef. The sea seldom breaks on it during ordinary weather, because it is sheltered from southeast winds; at low-water springs three rocks show above the surface.

Uailu passages are situated abreast Buru Bays and Uailu, each distant about 8 miles from the passes.

Uailu East Passage.—This opening in the reef will be found about 7 miles northwest of Kuaua passage, and is separated from the west passage by a bed of coral on which stand the sandy islets Maronu. Off the southeast end of that reef there are four detached rocks with 1 to $1\frac{1}{2}$ fathoms over them. A fifth rock, covered by $2\frac{1}{2}$ fathoms, lies still farther southeast and narrows the channel considerably. The leading mark through the passage is Cape Three Pines, bearing 207° .

In the center of the pass the ebb stream runs northeast; near Maronu Reef the flood runs southwest, and southeast along the reef on the southeast side.

Uailu West Passage is 5 miles in width between the visible reefs, but is obstructed by four dangerous shoals, the three smaller of which divide the channel. The leading mark for the channel southward of them is Uailu Head bearing 218° , and through the northern one the eastern extreme of Cape Bocage bearing 224° .

A vessel bound for the anchorage of Uailu should enter by the weather side of the west passage, and the course 218° for Uailu head may be continued till on the meridian of Toveru Islet, thus passing between the two reefs lying north and northwest of Neni Islet.

St. Exupere and Ugue Passages.—These two passages (which are next in order when proceeding to the northwest) are encumbered with dangerous rocks, rendering them unsuitable for seagoing vessels.

Buru Bays.—A chain consisting of five reefs extending nearly 4 miles along the coast, inclosing a space about 1,400 yards wide at each end and less than 100 yards near the center, form Buru Bays. Those open spaces and channel have depths of $6\frac{1}{2}$ to 11 fathoms, over good holding ground. The channel connecting the bays is practicable

for a steam vessel, but great care must be taken to watch for the heads of coral.

On the western reef stands Toveru Islet with trees on it. At 1,200 yards 369° from the north point of the islet there is a bank 150 yards long north and south with a depth of 2 fathoms over it, with 4½ fathoms close round deepening suddenly to 11 fathoms.

To the northwest of the latter shoal a head of coral covered by 1½ fathoms has been marked by a buoy. It lies about 1 mile 314° from Toveru Islet.

Passages.—There are six passages into Buru Bay, either through or round the reefs. The eastern entrance, between East Reef and Observation Spot (the latter about a mile southwest of Cape Three Pines), is about 600 yards wide between the reefs. The shoals marked on the plan can be seen from the masthead. The north end of the reef, with 3 feet of water on it lying in the entrance between East Reef and Cape Three Pines is marked by a small black cylindrical buoy. The next two openings between the eastern reefs are scarcely practicable. Between Buru and Shelter Reefs the channel is sufficiently clear and safe. The course should be rather on the west side of the center in order to avoid the 2-fathom ledge which runs off from the end of Buru Reef.

The next entrance is between Shelter Reef and the bed of rocks on which Toveru Islet stands. It is equally practicable, although there is a head of coral nearly in the center, with only 3½ fathoms over it. Here it is necessary to go more over to the east side of the channel. The passage west of Toveru Islet is equally available, while guarding against the rock with 2 fathoms over it, lying near the center of the approach (beyond the limit of the plan), and also the 1½-fathom patch which is marked by a buoy as above mentioned. In the absence of the buoy, Toveru Islet should be brought to bear 151°.

Anchorage.—The best position is southwest of Shelter Reef, about halfway between it and the shore reef, in about 9 fathoms, perfectly protected from the sea.

Uailu is situated to the northwestward of Uailu Head, a hill 194 feet high, situated 257° from Toveru Islet. Shoals extend more than ½ mile from the beach of Uailu. A vessel requiring to remain a long time in this vicinity will have the advantage of being able to anchor to the southwest of Toveru, at about 800 yards from the shore, there she would be sufficiently protected from an easterly or southeasterly sea. If, in order to reach that anchorage, she has passed between Neni and Toveru Islets, she should round the reef of the latter at less than 200 yards in order to avoid the 2-fathom shoal.

Uailu River is accessible to small craft. When rounding the reef on the west side of the hill, more than 1 fathom will be found at low water.

Ba Bay, also known as Lebris Bay, is on the south side of Cape Bocage. There are two shoals in the offing—one at 1,200 yards 170° from the extreme point, and covered by $2\frac{1}{2}$ fathoms; the other lies $1\frac{1}{4}$ miles 61° from the same point, with some heads awash at low water. The mark for passing to the southward of the latter shoal is Cape Three Pines in line with or slightly open westward of Neni Islet. Another shoal with 1 fathom over parts and the remainder awash lies $2\frac{1}{4}$ miles 111° from the extremity of Cape Bocage. Cape Kua open southward of Neni Islet leads southward of it.

Ba Bay is 1,750 yards wide at the entrance, 600 yards at the inner part, and the extreme length is nearly 4 miles. The depth decreases gradually from 6 fathoms at the entrance to $2\frac{1}{2}$ fathoms halfway up and very shallow at the inner part. The south side of the entrance is formed by a round hill 184 feet high, with a few trees on it. At 650 yards northwest from that hill there is a thick group of firs.

Anchorage.—The best position in this open and shallow bay is 347° from the cluster of firs, in 4 fathoms, mud. It is better to anchor near the north shore than the south, as there is always a heavy sea on the latter, and landing may often be effected on the north side when it could not on the south. The holding ground is excellent at all parts, but during a strong southeast wind the waves roll in almost as heavily as they would in the open sea.

Directions.—On leaving Ba Bay for the northwest, besides the dangers before mentioned, it will be necessary to avoid the shoal $2\frac{1}{4}$ miles northward of Cape Bocage, which is nearly awash and generally visible. To pass eastward of it, avoid bringing the extremity of Cape Bocage to the eastward of 179° till the hill on the northwest side of Ugue Bay (on which there is a white pyramid) is half a point open of the northwest part of the peninsula, of which Cape Bocage forms the southeast point. There is also a passage within the shoal, where the shore reef is very steep.

Cape Bocage.—This prominent headland is a detached steep-sided hill 1,400 feet high. The isthmus at the west end, which connects it with the mainland, is not many feet above the sea. When seen from a distance to the southeast it looks like an island of great elevation and almost regular curvature.

Ugue (Forester) Bay.—The anchorage in this bay is easy of access, but the space between the reefs is narrow and the shoal water extends nearly $\frac{1}{2}$ mile from the head of the bay. Upon the northwest point of the entrance there is a cluster of fir trees, and westward of the same point a hill 410 feet high. The shore reef on the south side is moderately steep-to, but a shoal with only 3 feet over it at low water lies off the west end of the reef. The best anchorage for small craft is to the westward of that shoal; the holding ground is excellent.

Water may be procured with ease at a small mountain torrent at the western angle of the bay or in the river, which a boat can easily ascend.

Harcourt Islets and Shoals—Beacon.—These two islets Ague and Karu lie to the northward of Ugue Bay, and being covered with trees serve as marks for the adjacent shoals. There is a large reef between the islands and three detached shoals to the southward of it. The passage to the southward of the islands has been rendered safe and easy by the erection of a beacon on the inner and most prominent detached rock, which may be passed on either side. In the absence of the beacon the clearing mark to pass the northward side of that rock is the small hill which terminates Cape Kua on with the extremity of the land near Cape Bocage till Karu Islet bears 32°.

At 2½ miles 274° from Karu Islet there is a shoal having 3 feet water. It may be passed on the south side by a bearing of the beacon above mentioned, or after the shoal on which the beacon stands has been passed, by hauling in toward the coast till the whole of the land about Cape Bocage has disappeared behind the hill on the north side of Ugue Bay.

Bayonnaise Shoals.—This cluster of dangerous rocks lies northwest of Harcourt Islets. The clearing mark for passing northeastward is the fir trees on Tidiauot Islet slightly open eastward of the coconut trees on Cape Baye. To pass on the southwest side between the principal portion of the Bayonnaise Shoals and the 3-fathom patch which lies detached still farther to the southwest, the east side of Karu Islet should touch the west side of Ague Islet, bearing about 125°.

There are several other shoals in this vicinity which are shown on the charts; great caution is necessary. The best route is apparently alongshore from Cape Bocage northward.

Moneo River.—Vessels may anchor off the mouths of the Moneo River in 9 to 11 fathoms.

Mu River lies 4 miles northward of the Moneo, with a high precipitous headland between. A sandy beach extends from that head to the entrance of the Mu River, which when seen from the eastward is marked by a low point, which is covered by coconut trees. That entrance is well protected by the formation of the shore reef, and is generally passable by large boats even in bad weather.

Punereuin River.—This river gives access to some plantations. Coasting vessels go into it, there being 10 feet at the entrance at low water, but only 5 feet at 670 yards up.

Vessels anchor in 6 to 8 fathoms, with the north end of the mangrove bushes (on the south side of the river) bearing 246°.

Ile St. Ignace (Hardy Island).—Northward from the mouth of Punereuin River and close to the shore, an islet, formed of clay and covered with mangrove, stands on a reef, from which points project both north and south. Between that reef and the shore reef there is a narrow crooked passage in which boats may find good shelter to leeward of the island and its reef. There are a few coconut trees on one part of the island, but the mangrove renders access difficult.

Tiamba River, a watercourse of some importance, discharges about 5 miles to the southward of Cape Baye.

Uindo Plain lies northward of the Tiamba River. Vessels may anchor off it in moderate weather.

Ti Uaka (Cape Baye) Passage.—This passage, which is free from known danger, has a width of over 2 miles, and lies about 6 miles eastward of Cape Baye. The southeastern and highest summit of Cape Baye (Mount Puat) bearing 268° will lead obliquely through the passage.

In Ti Uaka Passage the flood stream sets northwest and the ebb southeast.

Pine Islet stands on the bed of rocks which forms one ring in the double chain of barrier reefs which separate Ti Uaka from Fourmi Passage. It is a low sand islet covered with shrubs. To the southeast and northwest of Pine Island there are two other sand islets covered with bushes. The latter is on a reef of rocks which forms the northwest side of Fourmi Passage. There are other sand islets on the outer reefs, but in the presence of those which are covered with bushes they are of no use to the navigator.

Fourmi Passage.—Though the position of this passage is so well marked by Pine Islet, it is too narrow and intricate to be used by vessels.

Cape Baye has two hills over it, 1,339 and 1,365 feet high, respectively. A smooth, gentle declivity, having a mean width of about 550 yards, separates the foot of the mountain from the sea, which is bordered by a number of coconut trees.

Between 1 and 2 miles 89° from the cape there are two dangerous patches of rock, covered by 1 fathom of water. There is also a shoal covered by $2\frac{1}{2}$ fathoms about halfway between those patches and the southern end of Ti Uaka Reefs.

Tidiauot Islets.—These two islets lie off the high land extending westward from Cape Baye. The southern and largest is bordered by a sandy beach, it has bushes over the greater part, and is covered by fir trees at the southeast end. The other is a sandy islet surrounded by a reef which extends about $\frac{1}{2}$ mile north and south.

Ina anchorage.—From Cape Baye the coast trends westward about 4 miles before turning to the northwest, and in that space, 179°

from the sand islet Tidiauot, will be found Ina rivulet, which may be known by a house and a small white church belonging to the Catholic mission. Anchorage may be taken opposite the stream in 8 to 11 fathoms, on muddy bottom, protected by a cape from the swell from the southeast and toward the northeast by the proximity of Ti Uaka Reefs.

Wagap.—On proceeding from Cape Baye to the northwest the coast presents a number of small very green hills, which are agreeable to the eye after being exposed to the red glare from the land at the southern part of New Caledonia. Between those hills there are some patches of sandy beach bordered by coconut trees and native villages.

Wagap or Ti Uaka is the principal village. The buildings composing the French establishment and mission are screened from view, when approaching from the southeast, by a number of coconut trees, but from the direction of Cape Tuo they can be seen from some distance. A stone jetty 87 yards in length has been constructed at the end of an avenue which leads from the mission to an opening in the shore reef.

Anchorage.—A good position will be found about $\frac{1}{2}$ mile from the jetty in 8 or 9 fathoms, sandy bottom, with the line of avenue open bearing 224° , and the low extremity of Cape Baye in a line with the west side of Tidiauot Islet. It would not be prudent to go closer inshore, as at half the above distance the bottom is foul and the heavy sea which gets up even in a moderate breeze would cause a difficulty in getting under way.

Ti Uaka River falls into the sea between Wagap and Kokingone Creek. The depth is only $2\frac{1}{2}$ fathoms at 670 yards out and $5\frac{1}{2}$ fathoms at $\frac{1}{2}$ mile. The sea breaks with violence at some distance from the beach.

Kokingone and Punindu Bays.—The first is to the northwest of Ti Uaka. It is open to the eastward and receives two small streams. The second bay is similarly exposed to the ocean swell; it receives one stream from the heights of Tuo.

Cape Tuo is a conspicuously prominent point. It appears green and has on it three clusters of pine trees. From the cape the coast turns abruptly to the westward.

Tidal streams.—Between Cape Begat and Cape Tuo the flood runs northwest and the ebb southeast. These streams are greatly influenced by the prevailing wind.

Tuo Passage, about 2 miles eastward of Cape Tuo, is the finest channel in the barrier reef on the east coast. It is about 5 miles wide between Mengalia Reef on the north and the sand islets lying northwestward of Tiuka Reef, and deep. A patch of 8 fathoms lies on the northern side $\frac{1}{2}$ mile from Mengalia Reef. Ain Islet lies $1\frac{1}{2}$ miles

northward of the north side of the passage on Mengalia Reef and may be useful as a mark.

The hill, 1,575 feet high, with Cape Tuo bearing between 257° and 274° leads in the fairway.

Bonite Passage, between the two sand cays just mentioned, south side of Tuo Passage, has a safe space $\frac{3}{4}$ mile wide, but difficult to navigate by a sailing vessel during the ordinary southeast trade wind.

Central passage, between the eastern sand cay and the northwest end of Tiuaika Reefs, is more or less encumbered with shoals and is not recommended.

Tuo Bay is westward of the cape of the same name. It is encumbered by numerous heads of coral, which render it unsuitable for large vessels, but affords good shelter for small craft.

It is marked by beacons and buoys in accordance with the uniform system.

Atit Island, situated on the shore reef between Tuo Bay and the cape, is low and covered with mangrove.

Tuo Bank, covered by $1\frac{1}{2}$ fathoms, lies about $1\frac{1}{2}$ miles 248° of the outer reef which incloses Tuo Bay. The mark for passing southward of it is the north point of Uao Islet touching the south side of Ienga Islet.

A small reef awash lies $\frac{1}{2}$ mile northward of the foot of the hill which forms the west side of Old Tuo Creek. The mark for passing northward of it is the summit of the east point of the entrance to Tuo Bay, slightly open to the northward of the west point of the same bay.

Coast.—**Pindil River** lies 1 mile westward of Pindil Hill, on which there is a pyramid 266 feet high. On the left bank of the Pindil at a short distance from the shore Violet Rock will be seen; it is the southernmost of the curious basaltic rocks which border the coast as far as Yengen. Ti Pindil Bank extends more than $\frac{1}{2}$ mile from the shore in front of the mouths of the river.

Les Charpentiers.—To the northward of Ti Pindil Bank, near the middle of the passage and south of the wooded islet Ienga, there is a coral reef, from which some heads emerge at low water. It is marked by a buoy.

In the absence of the buoy, the southwest side of Ieh-Hingen Islet touching the foot of Cape Colnett (the farthest land visible to the northwest) will lead southward of les Charpentiers. On their north side of the clearing mark is Nindio Islet, its width open of the Towers Rock, both at the entrance of Yengen.

Port Yengen.—The Towers (called sometimes the Towers of Notre Dame, and by the natives Ponga) are very remarkable rocks,

of the form which their name indicates, standing at the east side of the entry to the port. They form an excellent landmark. The port is exposed to wind and sea from northeast and north. During winds within two points on either side of southeast this bay affords the best shelter to be found between Ugué Bay and Port Pueblo.

It is not desirable to go too far into the bay; a good position for a small vessel will be found in $3\frac{1}{2}$ fathoms, on a bottom of black mud, with the Towers Rocks bearing 89° .

Telegraph.—There is a telegraph station at Yengen.

Wiciem.—In the immediate vicinity of Wiciem, 6 miles westward of Yengen, the coast presents a bare aspect, in consequence of exposure to the action of the waves from the open ocean, while right and left of it the vegetation flourishes down to high-water mark.

The river is only available to boats.

Tidal streams.—In the passage in front of Wiciem the flood sets to the southward or south-southeast. On approaching the shore it divides into two branches, one going to the southeast rejoins the stream of flood running along the reef to the eastward of Ieh Hingen Islet; the other branch runs to the northwest into Panie Passage while the ebb runs to the southeast in that passage.

Between the inner reefs from Cape Colnett to Pueblo and the shore the flood runs to the northwest and the ebb to the southeast.

Caution.—A sailing vessel passing Wiciem Valley with a fresh land wind, or the southwest wind well established, should be prepared for heavy squalls, because in very fine weather there is generally a double-reefed topsail breeze in front of that valley, while there is a calm or light breeze along the coast on either side. It sometimes happens that similar squalls are felt during the day when the trade wind veers to south-southeast. Similar phenomena occur at Ubatu and before some ravines in the immense mountain mass near Cape Colnett, though less frequently.

Barrier reefs—Mengalia Reef.—The places just described, westward of Tuo, may be approached from the westward in a steam vessel, by the undermentioned passages, but a sailing vessel should enter by Tuo Passage and so have a favorable wind. About 2 miles northward of Cape Tuo will be seen the wooded islet Ain, surrounded by a sandy beach and standing on Mengalia Reef, about $1\frac{1}{2}$ miles 347° from the extreme end, before mentioned. From the islet the reef trends 347° nearly 8 miles before bending about 291° , in which direction it extends 5 miles, and is continued by the detached reef Doiman 3 miles farther. From the latter to Colnett Reef, a space of 18 miles, the barrier reef is broken up and there are several navigable passages.

Grand Pass.—To the southwest of Doiman Reef, between it and Dongan Iengu, lies Grand Pass, 3 miles wide, with a depth of about

20 fathoms, which depth continues nearly to the shore, but the bottom is irregular and other patches may exist not shown on the chart.

Though the passage is safe, it is unserviceable for sailing ships, as they would have to work up against the ordinary winds.

Four Brothers, on the western side of Grand Pass, have depths of 1 to 2 fathoms. The center of the reef lies $1\frac{1}{2}$ miles 111° from Dongan Iengu. The leading mark through the channel between Dongan Iengu and the Four Brothers is the north side of Chester Hill (nearly 1 mile 111° from the Towers), on with the north side of Ienga Islet bearing 252° .

For smaller passages see the chart.

Yengen Passage lies 7 miles westward of Grand Pass. It is about 3 miles wide and deep in the entrance. Entering from the eastward, steer toward Nindio Island when it is seen nearly halfway between the islets Iehgabate and Ieh-Hingen bearing 198° . Care must be taken to avoid the west side of the detached reef Duok, which lies southwest of the end of Kaun Reef, and forms the eastern side of the passage. As it is sheltered, the sea seldom breaks on it and it is scarcely visible.

Tilgerit Pass, the narrow channel westward of Yengen, has a buoy on the Tilguit Island Reef on its north side. The channel is between it and a $1\frac{1}{4}$ -fathom patch.

Cape Colnett.—This is the most salient point from the grand range of mountains which commences northwest of Yengen, and was the first land seen by Cook when he discovered New Caledonia, in 1774. It is the highest part of the island. The mountains in the immediate vicinity of the cape—that is, between Panie and Tiaue—are nearly all sharp serrated ridges and about 4,600 feet high, but the highest peak, which is about $2\frac{1}{2}$ miles from the coast, attains the altitude of 5,570 feet above the sea.

Tao Pass is between Colnett and Tao Reefs. Two heads of coral covered by $4\frac{1}{2}$ fathoms lie in the center of Tao Pass, and there are shoals projecting some distance from the reef on each side; beside which a dangerous rock, covered by $1\frac{1}{2}$ fathoms, lies at $\frac{1}{2}$ mile 314° from the extremity of the reef on the south side.

Puail Pass, southeast of Tao Pass, is not recommended. It is situated to the northward of Panie Village and is deep but narrow, and is rendered still narrower by detached rocks off both reefs.

Leleizour Passage.—**Colnett Reef** is about $7\frac{1}{2}$ miles in length, the outer part being about 3 miles offshore. The northwest end is separated from Seine Reef by Leleizour Passage, which is 700 yards wide between the visible parts of the reef, but in consequence of sunken rocks extending from both sides the navigable channel is reduced to half that width. The southeast side is preferable.

In the absence of good leading marks reliance must be chiefly placed in a good lookout from aloft; but there are two cascades near together from 1,000 to 1,300 feet high, and the course in 215° will be directly between them.

After entering Leleizour Passage, if bound to Ubatì, a course 269° for 2 miles will bring the vessel off Yambe Pass through the inner reefs, but if bound to Pueblo, the low distant point Madiemate or Bailly (with a clump of pine trees on it) should be steered for, or a little to the northward of it.

Seine Reef.—Commencing at Leleizour Passage, this reef extends 302° about 8 miles to Pueblo Passage. At the elbow toward the sea, about one-third from the west end, there is an opening which gives access to a deep lagoon, which is perfectly closed around the inner part. Care must be taken not to mistake that opening for Pueblo Passage.

Tiaue Pass, westward of Cape Colnett, is between the coast in the vicinity of Tiaue and along reef to the northeast, about 1 mile distant. The shoals on the south side are the fairway are marked by beacons.

Ubatì Point.—About 8 miles westward from Cape Colnett will be seen Ubatì Point, covered with coconut trees. A settlement stands upon a small ridge of hills situated between the two torrents Pue-Tamboa and Pue-Garana.

Port Henry anchorage.—To the westward of Ubatì Point anchorage may be found at Port Henry in about 4 fathoms, on mud and sand, good holding ground, and protected from the swell in all directions. Many vessels have ridden out gales there without damage.

Yambe Pass, leading into Tiaue Pass from Leleizour Passage, though very narrow, is deep and clear. The leading mark through is a remarkable red patch on the mountain above Yambe bearing 257° , but a lookout must be kept for a rock which lies close to the northward of that line. Cyclops Pass, farther westward, has two sharp bends and is strewn with rocks, therefore is not recommended.

Ubatì Pass (Tiambuen), situated to the northward of Tiambuen River, and $1\frac{1}{2}$ miles northwest of Port Henry anchorage, is used by vessels sailing to or from Ubatì and the northwest. It is marked by beacons and a buoy, but careful steerage and lookout from aloft is necessary.

Tchevit Pass.—This passage is the deepest of all between Tiaue Pass and Tchevit Bay. The latter is the only place to which it leads, and that at present is void of importance. The holding ground in Tchevit Bay is excellent, but with a fresh breeze from east-southeast the sea is very rough for boats.

Puebo Passage is the opening between the Seine and Puma Reefs; the position is easily recognized from seaward. On running along the outer side of Seine Reef at a short distance a bend in the Puma Reef, which trends about $1\frac{1}{2}$ miles southward, will be apparent; it forms with Seine Reef a funnel mouth to the passage, which of itself is sufficient to insure recognition.

The pine trees on Bailly Point (Madiemate) bearing 241° will lead through the center of the space between the reefs; also a hollow or notch in the high land and trees southwest of Puebo, through which the road to Bronde passes, bearing 232° , will be an equally good mark.

The coast from Puebo to Pudiue Islet is bordered by a be dof mangrove and a broad reef, which has many small openings capable of admitting large boats.

Pudiue Islet is low and was formerly covered with bushes, but is now bare. The reef on which the islet stands is separated from the shore by a channel available for country vessels; but there are many small heads of coral in it.

Port Puebo.—The access to this anchorage with the aid of the chart presents no difficulty. It will be sufficient to steer on the fairway between Muelebe Flat and the reef extending from Madiemate or Bailly Point, which point is covered with mangrove, and on the highest part to the westward a cluster of pine trees are useful as a landmark when passing through the outer reefs. Those pine trees are the most northerly on the east coast. It is remarkable that none other are found on the coast to the westward of the meridian of Madiemate throughout the north part of New Caledonia. They are seen in the interior, at Bonde for instance, but not near the seashore, though in the southern part of the island they are so common. During strong northeast winds the ocean swell enters Port Puebo, but the holding ground is excellent. Boats can ascend the river as far as the missionary establishment.

Inner route—Freycinet Flat.—This reef in the inner route is extended to the southeast by two dangerous rocks on which the sea usually breaks. The one farthest southeast, named Anlo, has sunken rocks off each end, and a detached rock lies about 1 mile farther southeast. Freycinet Flat has also detached shoal patches to the northwest. It is bold on the southwest side, where on the most salient point is a beacon, composed of an iron perch surmounted by a ball.

Those reefs and the long-shore reef extending southeast from Pudiue form the inner channel, which vessels usually take when going north. It is protected from seaward by Puma Reef. In the center of that channel the depth varies from 15 to 6 fathoms.

Balade.—The anchorage off this place within Freycinet Flat is only suitable for fine weather. The position recommended is that from which the flagstaff on Mahamate Point bears 115° and Pudieu Islet, 111° , in 7 fathoms, bottom muddy sand.

Tiari Cove affords anchorage in 10 to 13 fathoms, with the point of mangroves at Daoubine (the east side of the bay) bearing east and the extremity of the land to the westward of the bay 269° . The strong stream at each turn of the tide must be guarded against.

Durand (Pam) Bay, in the inner route, is between Pam Island and the mainland which terminates at Nendiaran Point. At about $\frac{1}{2}$ mile northward from that point there is a shoal with $3\frac{1}{2}$ fathoms, leaving a narrow channel between it and the shore reef; but it is preferable to pass to the northward and avoid it by not bringing the northern cliff on Pam Island westward of 269° .

A spit of sand extends westward of Nendiaran Point which covers at high water. At the extremity of that spit is a beacon surmounted by a ball. A triangular beacon has also been placed upon the north-east point of the reef off Pam Island.

To enter Pam Bay it is only necessary to steer about midway between the beacon off Nendiaran Point and the east side of Pam Island. The deposit from the Diahot de Bonde River tends to diminish the depths in the bay, especially about the southeast part, where there is a large bank, partially uncovered at low-water springs. The highest part of that bank, about 200 yards in diameter, lies 900 yards 66° from the southern summit of Pam Island. A narrow spit extends to the northward from that bank, covered by 13 to 16 feet, and leaving a channel with 16 to 23 feet on its east side.

Anchorage.—A large vessel should not go far into the bay, but in order to insure room to swing should anchor with the rock or islet close to Pam Island, bearing 201° , and opposite a creek formed by a recess in the highland to the southeast of Nendiaran Point, keeping the south point of Balabio open off the northeast point of Pam Island. That position appears to be too close to the tail of the bank in case of any wind except southeast. A small vessel may go inside the 2-fathom bank.

Telegraph.—A telegraph office has been established on the east side of Durand Bay, to the southward of the harbor master's office.

Diahot de Bonde River.—This is the largest river in New Caledonia, and is navigable by boats as far as Bonde village, about 18 miles up. The water is not fresh below Moingil or Muengine village, about 12 miles from the mouth. This river waters a long and beautiful valley, the greater part of which is inundated during the rainy season.

Tidal streams.—In the channel between Freycinet Flat and the shore reef, the flood sets to the southeast and the ebb northwest. To the westward of Freycinet Flat the flood entering by Balade and Amoss Passages divides, one part running to the southeast toward the inner channel, the other to the westward toward the Strait of Arama. The ebb runs in the opposite direction.

Balade Passage.—This is a safe passage, being $\frac{1}{2}$ mile wide between Puma and Balade Reefs, with a depth in the center of about 12 fathoms, but it is rather difficult of access to a sailing vessel during the prevailing wind between east by south and southeast by south.

If from the southward run along the reefs at a convenient distance till Balabio Peak bears 288° , then steer for it on that bearing until the central hills on Pam Island open out from behind the hill on Nendiaran Point, bearing about 260° . There will then be a choice, according to the prevailing wind, of entering either Balade or Amoss Passages.

When in the vicinity of Amoss Flat, it must be remembered that the ebb tide runs out of the passage on the east side of it.

Cook Reef.—The barrier chain of reefs extends from Amoss Passage in a direction a little to the northward of northwest about 98 miles, measured in a direct line, presenting throughout a continuous line of breakers with a few shallow inaccessible openings. The Great False Passage is serviceable for boats only. This part of the reef is generally steep and well marked on the sea side, and it incloses Balabio Island at a distance of 7 to 9 miles.

Ongombua Passage.—From Great False Passage the reef takes a bend more to the northward for 27 miles to Ongombua Passage, and that part of the reef is foul on the outer side, as well as the remaining 35 miles of reef still continuing to the northwest. At 15 miles 47° from the north end of Pott Island stands Ongombua Islet, with a surface of about 2 acres covered with coarse grass, standing on a reef which divides in two parts the first practicable passage found in Cook Reef after leaving Amoss Passage, over 60 miles to the southeast. Those two entrances are of moderate width, oblique to the general direction of the reef, and about 10 fathoms deep.

Northern passages.—At 8 miles beyond Ongombua there is another sand islet nearly covered at high water, standing in the center of a deep passage where the tidal streams are violent. Six miles farther there is a third deep passage, at least $\frac{1}{2}$ mile wide, without an islet. At 6 miles farther there is a fourth passage, wide and deep. Four miles farther there is a fifth entrance about 200 yards wide. Beyond that opening there is a reef 10 miles long, and to the northward of it a sixth passage, which is safe and not less than 5 miles wide; it is on the meridian of the north end of Pott Island.

At the northwest side of the sixth passage there is a large coral reef in the form of a horseshoe, open to northeast. The southeastern side dries at low water. On the northwest side a very large block of coral has been thrown up.

Finally, at 2 miles north of that horseshoe lies the last of the reefs on this side under the name of Cook Reefs. This mass of coral is 4 miles in length northeast and southwest. Its termination is approximately in latitude $18^{\circ} 48'$ S. and longitude $163^{\circ} 33'$ E. The streams are very strong near these reefs, and there is generally a heavy sea breaking on those last mentioned.

Inner route—Balabio Island.—This conspicuous island, about 4 miles northward of Pam Island, is $7\frac{1}{2}$ miles long and covered with trees. The central peak is 925 feet high; the west side is marshy and bordered by a grove of mangroves. The marsh gives birth to legions of mosquitoes which infest the island and even the anchorage.

Nendahande Islet, which stands to the southward of Balabio Island and on the west side of Napias Channel, is high, and when seen from the eastward presents two mounds forming a kind of saddle. It is one of the best marks of which bearings may be taken while navigating Napias Channel.

Napias Channel.—This narrow and crooked channel opens between the reef of the same name and the southeast point of the great reef which extends from Balabio Island. It can only be navigated by steamers or sailing ships with a fair wind; neither should undertake it when the sun is nearly ahead.

Alcmene Channel.—This channel is between the south side of the great reef attached to Balabio Island and the north side of Taabame. It is $\frac{1}{2}$ mile wide at the narrowest part and is easy of access, especially since the establishment of beacons on the prominent points of the reefs.

A detached reef with $3\frac{1}{2}$ fathoms over it lies 1,000 yards from the northwest point of Taabame Reef.

Harcourt Bay.—The space of open water westward of Pam Island and to the southward of Taabame Reef is Harcourt Bay, and may be reached from the westward by Alcmene Channel and Arama Strait. The water in this bay and the channel leading to it are (especially after heavy rains or gales) turbid to a great degree, and large light-colored patches, which may be mistaken for shoals, sometimes appear on the surface.

Anchorage is recommended toward the east side of the bay, near Pam Island, with the northern hill bearing 88° , in $5\frac{1}{2}$ fathoms, on white mud of such tenacity that it is difficult to break out the anchor.

Arama is a large village at the southwest side of Harcourt Bay, which may be reached from the eastward, either by passing to the north and west of Taabame Reef or by going between that reef and

the shore reef extending from Pam Island. The latter is Arama Strait.

Arama Peak is the culminating point of the jagged and nearly arid chain of mountains which runs parallel with the coast at that part of the island. It is 1,345 feet high, and is one of the principal landmarks, being visible from both sides of the island. A small red cliff, which terminates the northern shore of Arama River, is also a good object for the recognition of the locality.

Arama River is difficult and dangerous to enter or leave during strong east winds, even with country boats.

Taabame Islet, formed by a mass of sand upon which there are some mangrove and other bushes, acts as a beacon for the west side of the reef of the same name, where also some scattered tufts of mangrove may be seen at low water.

Anchorage.—Vessels from Arama Strait (close to Pam Island) will reach the anchorage off Arama by bringing the red cliff to bear 252° , and steering for it. If from Alcmene Channel the red cliff should be brought in a line with Arama Peak bearing 196° , and steered for, that line will lead about a quarter of a mile west of Taabame Islet and Reef. A good position will be found about $\frac{1}{4}$ mile from the river, with the red cliff bearing between 246° and 268° ; Nendahande Islet, between 21° and 26° in 4 or 5 fathoms. The bottom, in depths, is muddy sand; farther inshore it may be coral.

Winds.—In general the winds on the north coast of New Caledonia follow the direction of the shore. The southeast winds off the east coast become east-southeast from Balade to Tiari; east and often northeast at the northern part of the island, which sometimes allows a vessel to return to the west coast without tacking; that is, from Ti-a Islet as far as Neba Island.

Tidal streams.—The tidal streams are very strong in the northern channels, and vessels should not attempt to pass through them close hauled against an adverse tide. The flood entering by the passages on the northeast coast of New Caledonia penetrates into all the channels from east to west and from south to north. The flood sometimes attains a velocity of 5 knots in Arama Strait and Devarenne Channel. A sailing vessel should not try to stem the streams in any of these channels except with a free and steady breeze.

Devarenne Channel.—This channel is between Balabio Reef and the north side of Devarenne Reef. It is the only passage at this end of New Caledonia within the reefs suitable to large vessels going from the east to the west coast. The French corvette *l'Alcmene* passed through it under sail. The chart shows a least depth of $4\frac{1}{2}$ fathoms in the fairway. In general the greatest depth is found on the side of Balabio Reef. The channel is marked by beacons on the Balabio and Devarenne Reefs.

The entrance to Devarenne Channel is between the first of those beacons and Umap Point, which is a projecting red cliff with a sandy beach on each side.

The bed of coral lying to the southwest of Devarenne Reef forms three channels, impassable by vessels on account of numerous heads of coral, but they are accessible to large boats. A small vessel may possibly, with great caution, use the channel nearest the coast.

Anchorage.—The water being at all times smooth in these channels, a vessel may anchor anywhere under the lee of Balabio Reef, 813° from Devarenne Reef, or in Devarenne Channel itself, to the southward of the small opening in Balabio Reef and to the northward of Devarenne Reef.

St. Phalle and Olane Islets, on the west part of Balabio Reef, are covered with bushes and united by a narrow strip of sand. A sailing vessel bound south requiring to wait the turn of tide, may anchor close to the westward of these islets in 5 or 6 fathoms, on a bottom of sand and broken coral.

Anchorage.—The only anchorage on the west side of Balabio for a moderate-sized vessel is near its north extreme, with a small hill on the northwest side of the island, seen slightly to the westward of Arama Peak, bearing 178°, and the summit of Tahanlagh Islet (off the north end of Balabio), 30°. The bottom is sand, and it is an excellent anchorage during the prevailing winds.

Olane Bay.—This bight in the coast of the mainland to the westward of Pouthier Point is equally suitable as a temporary anchorage for a vessel when working to windward. To avoid the shoals Pouthier Point should bear 156°.

Daugae Islet is situated on the reef which borders the north extreme of New Caledonia. The highest part is a cliff at the north end, which forms a good mark for bearings. About 291° from that islet, about the center of the bay formed by the coast reef and the east side of Paaba Island, good anchorage will be found during south-east winds in 4½ to 6½ fathoms, on muddy sand, the southern hill on Yenghiebane Island showing through the middle of the opening between Paaba Island and the mainland.

Directions—Pam Island to Ti-a Islet.—Arama Strait, as well as the eastern end of Alcmene Channel, are entered by passing midway between the beacons on the reefs which form the passage. If bound to Arama the course will be between the reef from Pam Island and Taabame Reef till the small red cliff bears 252°, when the course should be in that direction; the water is generally muddy.

If it be desired to run through Alcmene Channel, there is no difficulty for a steamer in passing in either direction, nor for a sailing vessel going from east to west; it is only necessary to keep near mid-channel.

Arama can be reached from the west end of Alcmene Channel if preferred. From the anchorage off Arama a northwest course will lead to the entrance of Devarenne Channel, a short distance from the beacon on the elbow of Balabio Reef and opposite the red cliff of Umap. While running through Devarenne Channel a vessel should approach the Balabio Reef in preference to the south side, as the water is deeper. When St. Phalle and Olane islets bear 358° the course will be about 316° as far as Ti-a Islet, a distance of 14 miles.

On returning to the southward from Ti-a, while working to windward toward Daugae Islet, the starboard tack must not be continued after that islet bears 178° or the islet in a line with the peak on Pume Peninsula (seen over the land) gives a similar result as a turning mark. From abreast of Daugae a vessel standing to the eastward must tack directly Arama Peak shows to the eastward of Umap Point. Devarenne Channel is too narrow for any but short, handy vessels to work through, and that must be during ebb tide. Should they reach the entrance of the channel at the time of flood, they must choose one of the anchorages indicated and wait for slack water or change of tide. To the southward of Umap the limit of the inshore board is marked by that point coming in a line with Pouthier Point.

Grand Passage is between the terminations of the two long lines of reef which extend from New Caledonia, named Cook Reefs and French Reefs on the south side and d'Entrecasteaux Reefs on the north. The distance between those reefs is about 20 miles at their nearest approach. Two large lagoons are formed by the principal combinations of reefs, named Surprise and Huon, after the islets which stand on them.

This locality has not yet been surveyed.

The current generally runs to the westward through the Grand Passage at an average rate of 1 mile an hour.

Southern Lagoon.—This lagoon extends about 30 miles east and west and 20 miles north to south.

A reef lies from 1 to $1\frac{1}{2}$ miles north of Surprise Island, reported to be $2\frac{1}{2}$ miles long, east and west, by $\frac{3}{4}$ mile in breadth, and that it is joined to the great reef to the westward, which leaves no passage between them; also that northward of the east end of the island, at a distance of $\frac{3}{4}$ mile, the depth is 10 fathoms, and at $1\frac{3}{4}$ miles in the same direction it is 20 fathoms.

In January, 1900, the master of the Norwegian barkentine *Pelotas* reported having passed a breaking reef about 12 miles southward of Surprise Island, in Grand Passage, in approximately latitude $18^{\circ} 38' 30''$ S., longitude $163^{\circ} 12' 00''$ E.

Passages.—On the west side of the reef which incloses the lagoon there are many openings, of which three at least are practicable: First, the passage on the west side of Surprise Island; second, at $2\frac{1}{2}$ miles 111° from the first; third, the opening which separates Leleizour from Fabre Islet. The dispatch vessel *le Curieux* has gone through the first and third several times and found the depth considerable; the steamer *Ocean Queen* has taken the second on leaving the anchorage off Surprise Island.

There is another opening of considerable depth near the south-east elbow of the reef, but the currents are very strong across it and the sea is much heavier than at the three which have been recommended. The other openings on the northwest side appear to be blocked by rocks.

Surprise Island.—This island or islet stands upon a reef at the southern entrance to the lagoon and is nearly round, the mean diameter being only 550 yards. The flagstaff is in latitude $18^\circ 28' S.$, longitude $163^\circ 8' E.$

The surface of the island is 6 or 7 feet above the reef; there are but few trees and very little grass; the soil is guaniferous. Like all the islands in this group, it is surrounded by a gently sloping white sandy beach about 25 yards wide. On the northwest side a natural channel has been formed in the shore reef, which leads to the most sheltered part of the island. Wells have been dug (depth not stated) upon Surprise Island and on Huon Islands in the northern lagoon, but drinkable water was not reached.

Guano works (1907) have been established on the island. The chimney of the factory and the flagstaff are seen from 7 to 8 miles distant.

Reef.—Southwest of Surprise Island there lies a detached reef, about 9 miles in length northwest and southeast, separated from the west reef of the lagoon by a passage which appeared to be clear and about 7 or 8 miles wide. That reef shows large uncovered rocks along the whole length and a sand islet on the south end, which could be seen from the masthead at 6 or 7 miles.

Anchorage.—To the northward of Surprise Island lies the detached reef above mentioned, which limits in that direction what may be considered as the anchorage connected with the island. In that space, which is not more than $\frac{1}{2}$ mile wide from north to south, the anchor is dropped in 17 to 19 fathoms on fine sand, which is sufficiently good holding ground, though the southeast winds are very fresh and the tide sometimes runs 2 knots. The center of the island should bear 241° . There is also good anchorage with the extremes of the island 167° and 257° . The French naval vessel *Vaucluse* anchored here in 1907, with the extremes of the island 167°

and 238°, in 16 fathoms. On the north side of the detached reef above mentioned anchorage may be obtained in 10 to 20 fathoms, at distances varying from $\frac{1}{4}$ mile to 1 mile from the reef.

Fabre Island is about 1,100 yards in length southwest and northeast by about half that width. The ground is guanoiferous and 6 to 10 feet above the reef; it is well wooded and the trees, of the same description as those on Surprise Island, are higher. A coral reef surrounds it on all sides to a distance of $\frac{1}{2}$ mile.

Anchorage may be obtained on the northwest side of Fabre Island in 25 fathoms about 1 mile offshore, sheltered from the sea. *Le Curieux* in 1877 anchored about 1 mile to the southward of the east point of the island in 19 fathoms, broken coral; the holding ground was not good and the sea was rough.

Vessels intending to stay at Fabre or Leleizour should moor, laying out the heaviest anchor to the southeast.

Landing.—The approach to the beach of Fabre Island is everywhere strewn with masses of coral, but near the center of the northwest side there is a narrow, crooked channel between the rocks by which a boat may reach a sandy beach.

Leleizour Island, situated on a tongue of d'Entrecasteaux Reef, separated from Fabre Island by a deep channel 2 miles wide, is the largest of the group; its greatest length is 1,300 yards east and west and about half that in width; it is about 12 feet above the reef, bordered by a beach of white sand. The geological construction is similar to the other islands, and the trees on it are about 20 feet high. On the northwest side of the island a mole, which projects into deep water, was built many years ago by an Australian company for the purpose of loading boats with guano.

Anchorage.—The British vessel *Louisa* anchored in 6 fathoms, on coral bottom, $\frac{1}{4}$ mile offshore, with the flagstaff on Leleizour bearing 179°. In 1877 *le Curieux* anchored at 1,100 yards to the northward of the west point of the island in 17 $\frac{1}{2}$ fathoms, bottom sand and coral. Capt. Canar, a resident on the island, stated that there was no security at any of the anchorages in this lagoon during the bad-weather months, and that Huon Island, in the northern lagoon, alone affords shelter from the sea at that season.

North Lagoon.—This inclosure is about 16 miles long north and south and 11 miles wide east and west at the south end. It is separated from the southern lagoon by a deep strait about 6 miles wide.

On the south side of the encircling reef there is a sand islet, and at the north end some blocks of coral have been thrown up. Within the lagoon, both at the north and south ends, there are several heads of coral.

Passages.—The west side of the reef presents many openings a short distance apart. *Le Curieux* entered by the southern one, which

is more than 800 yards wide and very deep; it is easy of access. The course from that passage to the anchorage off Huon Island is 49° , and that track will be clear of the coral heads at the south end.

Huon Island, sometimes called North Huon, it being the northern of the d'Entrecasteaux group of islets and reefs. It is more than $\frac{1}{2}$ mile in length north and south and is prolonged at each end by a bank of sand as high as the surface of the island. The part of the island which is covered with trees is only about 100 yards in length. To the northward of the trees stands a mass of rocks several yards high, composed of blocks of coral and solid conglomerate of sand, coral, and shells.

To the westward of Huon Island there is a rock covered by 16 feet of water, with the extremes of the island bearing 71° and 128° .

Anchorage.—There is a well-protected anchorage about $\frac{1}{2}$ mile from the beach in 9 to 14 fathoms, gray sand, with the center of the trees bearing 99° . In August *Le Curieux* was at that anchorage during a very fresh southeast wind; the water was found to be smooth and the holding ground excellent. To the southeast of that anchorage and near the shore a small oval bed of coral was seen.

Landing is easily effected on the long beach of Huon Island, especially at the south end. It is probable the facility of access and smooth beach attract numerous turtle, more than at the neighboring islands.

Outer Reef.—To complete the description of the coral reefs which lie to the northward of New Caledonia, the East or Outer Reef must be mentioned, though it is at present unexamined. According to the description of M. Laguerre, it is to eastward of the two lagoons just described and runs in a direction about north and south. To the southward it does not extend beyond the parallel of Surprise Island and perhaps not so far; to the northward it terminates about 10 miles 89° from Huon Island. The greater part of this reef is under water.

Directions.—When bound to Surprise or the Huon Islands from the southward steer for the north end of New Caledonia; then continue along the French Reefs, which are generally distinctly visible, until abreast their northern end, which may be recognized by two black rocks appearing detached, about 2 miles from the termination of the reef. From thence steer northward toward Surprise Island, which is visible from a distance of 12 miles, and the west end can be rounded at a distance of about 1 mile.

Inside d'Entrecasteaux Reef the sea is smooth, but as the tidal streams run strong at times it is well not to enter without a commanding breeze.

Should a vessel arrive at Surprise Island too late to reach Fabre or Leleizour Islands during daylight, anchorage should be taken up

near the former island until the next morning. If unable to reach Surprise Island before dark, it is recommended to stand to seaward.

Tides.—It is high water, full and change, at Fabre and Huon Islands at about 5h. 40m. Springs rise about 6 feet.

Winds.—In this neighborhood the southeast trade wind prevails, interrupted at times by northwest and west winds. For the first four months of the year a prolonged stay here is not considered safe, as at that time hurricanes are not uncommon in this part of the Pacific.

Petrie Reef (Betsy Reef).—This reef was discovered in 1836. The north point of the reef is charted in latitude $18^{\circ} 26' 30''$ S., longitude $164^{\circ} 19' 50''$ E., but it is reported to lie 10 miles farther eastward.

At the north end, for a distance of 3 miles, the reef runs east and west, thus forming with the southern banks an extensive basin, open to the northwest, where anchorage may be found during the fine season, sheltered from the swell in every direction, except between northwest and southwest. The bottom is white sand and the depth diminishes gradually toward the reef.

The opening is about 2 miles wide leading into the lagoon. A small detached reef lies just within, on the northeast side of the entrance. There appeared also to be a small opening at the southern extremity of the main reef. On the western and southeastern sides of Petrie Reef there are sand banks from 20 to 25 feet high.

Tidal streams.—Near Petrie Reef at spring tides the stream runs at the rate of 1 knot, the flood to the northward and the ebb to the southward. Off the northern extremity a strong tide ripple was observed, the stream at the time setting northeast by east.



CHAPTER VIII.

LOYALTY ISLANDS; ALSO ISLANDS, BANKS, AND DANGERS NORTH-WESTWARD OF THEM.

General description.—The Loyalty Islands are a French possession. As a dependence of New Caledonia they have not yet been completely surveyed. Their positions, forms, and dimensions as shown on the charts now in use leave much to be desired. A summary is here given of all the information which has been received respecting them.

The group is composed of five large islands—Mare (Britannia), N'dundure (Molard), Tiga (Boucher), Lifu (Chabrol), Uvea (Halgan); also the islets between Mare and Lifu, the Pleiades and Deguala Groups.

Population.—The population of the whole group was about 11,193 in 1909; they are of Polynesian origin and their language has much in common with the Fijian.

Currents.—Between Havannah Passage and Loyalty Islands little or no current was experienced by the British naval vessel *Dart* (1890) on three occasions, though prior to one of them a strong southeast wind had been blowing. A fourth time when passing near the same place a westerly set of 2 knots an hour was experienced; that was between Loyalty Islands and a position about 20 miles from Havannah Passage. In the latter position the ship was hove to under sail, with a light wind from east by north and during 12 hours was set to the eastward at the rate of 1 mile an hour. The trade wind had not been strong for some days, from which it appears that no reliance can be placed on the set of the currents in this locality.

On the same passage last mentioned, when between Loyalty Islands and Efate a set of $\frac{1}{2}$ knot an hour was found to be running west by north. On three other occasions over the same ground there was little or no current. As a general rule, it appears advisable to allow for a northwesterly set of $\frac{1}{2}$ knot an hour when the trade wind is blowing.

Mare Island, the southeasternmost of the group, is about 450 or 500 feet. The upper part is flat, with occasional slopes and terraces, its aspect is sombre, but large plantations of coconut trees line the lower parts near the shores, and on the upper part there are a few pine trees.

Uapao, Castle Point, or Cape Desgras is a remarkable peninsula projecting from near the middle of the west side of the island, having a hill in the form of a table, higher than the other flat-topped hills, and is covered with pine trees.

The south side of this point is steep-to. To the westward a fringing reef, narrow at first, gradually widens till it extends 200 yards. The depths are irregular off the point, ranging from 5 to 10 fathoms. Except close to the reef on the north side nothing less than 5 fathoms has been found; but as it is quite possible coral heads may have remained undiscovered, it is well to give the cape a berth of $\frac{3}{4}$ mile.

Tandine (Tadinu) Bay, northward of Uapao Point, affords the only good anchorage on the west coast of the island. The residence with its flagstaff and the two beacons on the shore northward are probably conspicuous.

There are two shallow coral patches, one 235° 600 yards, the other 325° 450 yards from the residence; they break continually.

Intending to anchor at Tandine after rounding Cape Uapao, steer to bring the white beacon which stands on the shore 750 yards to the northward of the residence to bear 52° , when it will be in line with a clump of pines on the heights. A depth of about 20 fathoms will be found with the residence bearing 104° . Anchoring to the northward of this line, the chain is liable to foul a head of coral on which there is 8 fathoms with 15 fathoms all around it.

The coral head lies with the beacon 63° and the residence 108° . Close inshore the bay is bordered with coral heads; they do not extend beyond 200 yards from the shore. Boats will find landing difficult except at the little creek half a cable to the north of the residence.

Tandine Bay to Mackau Point.—From 1 mile to the north of Tandine Bay reefs extend to 1 mile north of point Netieh. A detached reef, always breaking, and more than $\frac{1}{2}$ mile from the shore, lies to the southward of Point Netieh. Between this reef and the shore there are numerous coral heads, so the coast should not be approached here. Point Netieh may be recognized by a white house on the shore and easily seen from the southward.

Cape Mackau, which is the extreme northwest of the island, may be rounded at $\frac{1}{2}$ mile distance. The reefs bordering the point extend 400 yards from the shore.

Ro (North) Bay.—The north side of Mare Island eastward of Mackau Point is fringed by a coral reef to a distance of 400 yards.

The position of the landing place in Ro Bay may be recognized by two remarkable white cliffs. There is also a church or temple which may be useful as a landmark. An English trader is established in Ro Bay.

Coming from the west to Ro Bay, the shore must not be closely approached, to avoid a shoal 600 yards from the shore opposite the

temple. A white house on a hill and a white spot on the cliff, both in the eastern part of the bay, are useful marks.

The best anchorage in order to be sheltered in some degree from the swell which frequently sets in when the wind is from the east or even east-southeast is in 15 fathoms, with the sandy beach in line with a solitary pine tree on the heights, bearing 155° from 400 to 500 yards from the shore. Two other pine trees stand close together not far northward from the pine tree mentioned above as a leading mark, and with which they are not to be confounded.

A reef 200 yards broad fringes the shore opposite the village of Ro. A creek in the reef to the east of the temple serves as a shelter for boats.

The south part of the bay is clear, and easy landing will be obtained on the sandy beach. From this point paths lead to the neighboring villages.

The east part of the bay is not so clear. Between the solitary pine halfway up the cliff and the large white spot on the cliff are several patches close to the shore. Three small reefs, showing clearly even when not breaking, lie from 500 to 600 yards 303° from the white patch, with deep water close alongside them.

Ro Bay to Cape Roussin.—To the eastward of Ro Bay the coast trends northeastward for about 5 miles, terminating in Cape Roussin, the northeast point of the island. The coast is clear for the first 3 miles, faced by precipitous cliffs. From the end of these cliffs to Cape Roussin the coast is much lower and forms a small bay with a sandy beach; it is encumbered with patches, joining up with the large reef which projects from Cape Roussin.

Cape Roussin.—To the east of the small bay mentioned above the coast gradually ascends to Cape Roussin. On the north extremity, which is rather low, is a conspicuous sandy beach. The eastern side of the cape is precipitous. A reef extends northward of Cape Roussin about 1 mile. A wide berth must be given to this cape at night.

To the north of Cape Roussin a lagoon is formed in the reefs. It has not been examined, but from the masthead it can be seen to be shallow. The anchorage to the southward of the cape is not recommended.

De la Roche anchorage (Poane Bay) lies between Cape Roussin and Cape Coster, 9 miles apart, in the southern part of which is Poane Bay anchorage, known also by the French as the De la Roche anchorage.

From Cape Roussin to this anchorage the coast is less precipitous. It is fringed by reefs the breadth of which varies from 100 yards to 500 yards, with occasional heads a little farther out. Two sandy

beaches are found in the northern part, one at the elbow of the Roussin Peninsula, the other a mile farther down.

The south coast of De la Roche Bay is remarkable for several flat-topped hills and a cylindrical-shaped rock with vertical sides and no vegetation, which is known as La Pierre, and is easily distinguished; it is a good landmark. The top of the spire of De la Roche church is also a landmark, but it is hidden on nearing the shore. The anchorage here is indifferent, the swell rolls in even with southeast winds, and, except in very fine weather, is no place for a long stay.

Making for this anchorage La Pierre, a hill just within the shore should be brought to bear 165° and the anchorage approached on that bearing, anchoring in 20 fathoms 700 yards from the shore.

Landing will be found at the bottom of the bay close to a little hut at the edge of the cliff. This part is sheltered by offlying coral reefs, and the native boats lie in this shelter. From this anchorage to Cape Coster the coast is steep and clear.

Cape Coster is a perpendicular cliff with low land to the westward of it, which makes it appear like an island when seen from a distance to the northward.

East coast—Cape Coster to Cape Boyer.—Between these points the coast is precipitous and clear.

South coast.—Cape Boyer is the southeast extreme of Mare Island and is 12 miles south of Cape Coster. It is a low point projecting 500 or 600 yards from the cliffs and from which a reef extends about 400 yards.

Cape Boyer to Eni Point.—The coast is clear and may be approached. The most southerly point is known as Cape Medu.

Aui Bay lies northward of Eni Point, with the villages of Eni and Aui. It is open from south to west, but offering shelter from winds between north and east. So soon as the wind gets to the southward of east the swell comes in and is much felt at the anchorage. Eni anchorage is a poor one, because even with the usual southeast winds the swell rolls in. The bay contains some sunken patches and the anchorage must be approached with care.

With the exception of two off Eni, these dangers do not break and they are only visible under certain conditions of light. Two small reefs awash, and one with half a fathom of water southward of them, lie from 400 to 500 yards from the shore. They nearly always break and in any case are easily seen by their green color.

Directions.—To anchor at Eni coming from the southward give Eni Point a good berth and steer 336° .

When the conspicuous large single pine on the heights bears 106° that course may be steered until the two reefs near the anchorage are seen. On approaching, two pines, hidden at first by a plantation of coconuts, will be seen near the beach. Anchorage may be

had with the large single pine seen between these two pines 108° and with the innermost of the reefs in line with Eni Point.

Coming from the westward pick up the same marks. It is important not to be to the northward of this line in order to avoid the $2\frac{1}{2}$ -fathom patches shown on the plan and which are not visible.

Aui Bay to Cape Uapao.—From Aui Bay to Cape Uapao the coast is fringed by a reef about 200 yards broad. This reef ends a little to the eastward of the cape, which is clear to the southward.

All this part of the coast is marked by sandy beaches.

Islands.—**Molard (N'Dundure) Island**, about 1 mile off the northward extreme of Mare Island, has two bare sloping mounds with low land between them which gives it the appearance of two islands when seen from a distance north or south. The island is clear all around. The passage between this island and Mare is supposed to be clear.

A columnlike pine, the only visible tree, is to be seen on the east coast. A leper settlement for the natives of the Loyalty Islands is to be established on this island.

Leliogat (Hamelin) Islet, which stands about 292° from N'dundure Island, is low and almost bare; only a few bushes are to be seen. It appears to be free from danger at a short distance. The weather side is steep and upon it the sea generally breaks violently. Uo (Laine) Islet, northward of it, is low and covered with pine trees.

Tiga (Boucher) Island is about 15 miles to the northward of the northwest point of Mare Island. It is composed of coral and the shores are principally formed by perpendicular cliffs and has a smooth level summit about 250 feet high. There are some small trees and bushes in many parts.

The south, southeast, and north points are foul to the distance of 400 yards or more; the southwest and east coasts are clear.

At the northwest end of the island the hill ends 500 or 600 yards from the shore. On this kind of plain stands a Kanaka village of some size. There is sufficient water between the reef off the north end of the island and the shore to permit the native boats to find shelter. A small passage exists to the southwest of the village. A sandy beach makes landing easy.

This island is used by the French as a sort of convict establishment for the worst characters among the natives of Loyalty Islands.

Vauvilliers Island, nearly 5 miles westward of Tiga, is $1\frac{1}{2}$ miles long by $\frac{1}{2}$ mile broad. Its northwest point is very low. Although its coasts are clear of danger, it would be prudent, if passing it at night, to do so to the eastward, it being more visible on that side, where pine trees are to be seen.

Lifu (Chabrol) Island.—This island when seen from a distance presents a succession of plains nearly the same height. The south end

of the island presents two salient points. The one to the eastward is Cape Deflotte, which is long and low, and the sea breaks heavily on the outer part; the land from which it projects is high and almost perpendicular, so that from a distance the cliffs alone are visible. The other point (at the south end) is similar to Cape Deflotte, but projects a shorter distance; the sea breaks on the shore throughout the intermediate space.

To the northward of Cape Deflotte will be seen Cape Pine, the eastern point of the island. It is a small wooded peninsula connected by a low isthmus; at a distance it looks like an island. For about 400 yards northwest of Cape Pine the soundings decrease gradually. There is a station of the London Missionary Society on Lifu.

East coast—Vadha Bay.—The bay between Cape Deflotte and Cape Pine is known to the natives as Vadha. It is on this part of the coast that the native chief resides. His house can be seen from seaward. Another house near the shore is also to be seen a little farther to the south.

Coast.—One mile to the northwestward of Cape Pine the coast recedes for $\frac{1}{2}$ mile and, barred by a reef, forms a port with a passage leading into it where small craft can lie. Here is situated the Kanaka village of Loangani.

This little bay has on its north side a low point, surmounted by a high cliff covered with pines. Coming from the north this point is seen before Cape Pine, for which it might be taken. The pine trees, so numerous about here, cease from this point, and except an occasional one, are not seen till Sandal Bay on the west coast is reached. Continuing toward the north, occasional sandy beaches will be seen and isolated houses close to the shore, which is generally fringed by a narrow reef. The most prominent point hereabouts is Cape Daussy, 12 miles northwestward from Cape Pine.

Chateaubriand Bay, on the east side of Lifu, is extensive, but its shores have not been examined. Depths of 32 fathoms were found in this bay at about 900 yards from the shore. Temporary anchorage might be found close inshore, but only with winds from the westward. Small coasting vessels find shelter close inshore inside the coast reef. The bay is much obstructed with coral patches.

Cape Bernardin.—From Chateaubriand Bay the coast, fringed by a narrow reef, after bending for $\frac{1}{2}$ mile northwestward, forming the north point of Chateaubriand, turns to the north for rather more than 6 miles, then eastward, forming Cape Bernardin. Cape Bernardin is free from dangers; it forms the northeast extreme of Lifou Island. Shortly before reaching this cape two fine beaches will be seen, also two white houses close to the shore. The building farthest north is the Protestant Church of Nautiegetuan.

North coast.—From Cape Bernardin to Dokin Bay the coast is bare and precipitous and free from dangers. The general direction is northwest by west, with some unimportant indentations. A few coconut trees, with an occasional pine tree, are alone visible on the summit of the cliff.

Cape Escarpe.—Five miles northwestward of Cape Bernardin is Cape Escarpe, the north extreme of the island.

Dokin Bay.—Four miles to the west of Cape Escarpe the coast turns abruptly to the south, to turn again to the westward, thus forming Dokin Bay, so called from the village situated in its eastern part on the top of a cliff. The bottom consists of sand and coral. All around this bay stand perpendicular cliffs, the summit covered with thick bush. In the southwest part the cliff stands back from the shore for a length of $\frac{1}{2}$ mile, leaving between the cliff and the shore a flat planted with coconut trees. Beyond this the coast again is precipitous.

The Protestant Church, a white building conspicuous from afar, stands on the top of the cliff, 1,600 yards to the southward of the northeast point of the bay. It is a good landmark.

Dangers.—The east shore of the bay, to the southwest of the church, is studded with coral heads. Three isolated patches awash lie 500 yards from the shore in this part. Another patch lies 400 yards from the shore. Opposite the eastern end of the coconut plantation, farther on toward the west, other patches exist, but they are nearer the shore.

Anchorage.—Between the patches off the plantation and those before mentioned near the east shore is a space of a mile in extent absolutely clear, with 18 to 20 fathoms of water 500 yards from the shore. This is the best anchorage.

A bight in the coast with a sandy beach, at the foot of Dokin Church, is the best landing place. A somewhat difficult path cut in the cliff leads to the village of Dokin.

Dokin Bay to Cape Aime.—From the west point of Dokin Bay to Cape Aime the coast is formed of precipitous cliffs.

Jouan Reef lies 5 miles 336° from the northwest point of Lifu. It is composed of two reefs, which together extend about 2 miles northwest and southeast. They show plainly, and there is an opening between the two divisions of the reef apparently free from danger. There is a passage between Jouan Reef and Lifu Island. The side of the latter appears preferable.

Sandal Bay, on the west side of the island, lies between Lefevre and Aime Martin Points. The latter bears about north and distant 7 miles from the former. Lefevre Point is of moderate height, with a reef extending 400 yards off.

Shelter Reef lies in the southwest part of the bay to the northeast of Lefevre Point. It is not easily seen, as the sea does not break on it.

At $1\frac{1}{2}$ to 2 miles northeastward from the same point will be seen a large perpendicular cliff of reddish-white color and covered with pine trees. Anchorage may be found in Gaatcha Bay, which is to the eastward of that cliff. On entering the bay care must be taken to avoid two rocks nearly on a level with the water, lying about 269° from the point covered with fir trees. The passage is to the eastward of those rocks and the anchorage is between them and the shore.

In the southeast part of Sandal Bay, between Gaatcha sandy beaches, there is a small islet, steep sided toward the shore, from which it shows detached. It is necessary to watch carefully the change of bottom, as coral rocks exist a good distance from the shore.

Iatio Point is on the northeast side of Sandal Bay, about 4 miles east of Aime Martin Point. It terminates on a steep-sided rocky hill which is covered with pine trees. The point has 10 fathoms close-to; but a reef awash lies at a little more than 200 yards to the southward of it. To the northeastward of Iatio Point the coast is bordered by a reef about 200 yards wide. A chapel standing on the extremity of Iatio Peninsula makes a good landmark.

Shepenehe (Wreck) Bay.—This bay is formed by a slight recession in the coast line between Iatio and Shepenehe Points, which lie about east and west of each other, distant 2 miles. The latter point presents a steep face and is covered with bushes. Northwestward from Shepenehe Point a large dark-colored rock stands close to the water's edge which from its form is called the Tower.

In Shepenehe Bay there are two reefs. One, having patches awash, lies about 1,750 yards 64° from Iatio Point; the other, showing two heads on a level with the water and having 5 fathoms around its south and west sides, lies about 1,900 yards 300° from Shepenehe Point.

Tides.—It is high water, full and change, in Sandal Bay at 6h. 30m.; springs rise from 5 to 6 feet.

Anchorage.—About $\frac{1}{2}$ mile northeastward of Iatio Point vessels may anchor in 10 or 12 fathoms, with the mission house bearing 336° . This anchorage is less frequented than that on the opposite side of the bay, where sailing ships are in a better position for getting under way.

Between the eastern reef and the west side of Shepenehe Point, there is anchorage in 8 to 11 fathoms, with the residence bearing about 21° . The holding ground is moderately good, provided there is a long scope of chain out. Nevertheless it would not be safe to remain during a southwest gale.

Landing.—Boats should bring the landing place in a line with a flagstaff which surmounts a conspicuous wooded triangle. There is a rock awash to the westward of that line at about 50 yards from the shore.

Water.—The only water obtainable is taken from wells; not very good.

Southwest coast.—To the southward of Lefevre Point the shore is formed of perpendicular rocks in every part. Between Lefevre Point and Cape Lafond the coast line recedes slightly, and at one part there is a small cove with some islets and rocks in it and also some spots of sandy beach. That part of the island is thickly wooded, and close to the water there are a great many coconut trees.

About 6 miles westward of Cape Deflotte there is a bight in the coast, 2 or 3 miles in diameter, with steep rocky shores all around. It is between two high points, of which the one to the southward is covered with fir trees. Those points are easily distinguished from seaward, and appear to inclose an extensive bay; it has consequently been mistaken by strangers for Sandal Bay.

Uvea (Halgan) Atoll.—The three islands forming this atoll present the appearance of a narrow strip of land, or rather a succession of limestone beds, which, combined, extend north and south for 23 miles, with a mean width of $1\frac{1}{2}$ miles, except at the north end, which is 7 or 8 miles across. On the west side there is a chain of islands named the Pleiades, which, with other islets and reefs, extend in a great sweep, almost a semicircle, from the southwest end of the smaller island to the northwest extreme of the larger, inclosing Uvea Bay, from 12 to 15 miles in diameter. There are many passages between the reefs and several anchorages within the lagoon.

Muli Island is the name of the southern island of the group. It is about 5 miles in length east and west and sunken rocks extend some distance from the south end.

The passage between Muli and Uvea is only practicable by boats. Near the center of the passage lies Wasau or Faiava Islet, with a chapel on the north end.

East coast of Uvea.—From Cape Lekin to Faiaue, a distance of 11 miles, the coast is steep, with a level top. Gervaise Point, about midway, is an abrupt termination of the adjacent plain, and not very salient. Faiaue or St. Hilaire Point is steep sided, and near it there is an isolated rock in the form of a column or obelisk. To the northward of that point the coast recedes, forming Faiaue Bay, nearly 7 miles wide, the north extreme of which is a point appropriately named Escarpe. All that part of the coast is covered with trees, and the general line of steep rocky shore is in some places interrupted by small patches of sandy beach. There is no landing on

any part of the east coast in consequence of the fringing reef which breaks and in some places extends some way off.

North coast.—From Escarpe Point the coast turns northwestward for 5 miles to Cape Rossel, the north extremity of the island, it then takes a southwesterly direction for 7 miles. This part of the island is more arid and rugged than the other. It is a continuation of the plain, with the addition of a number of peaks and hills. At 6 miles southwestward from Cape Rossel the north coast of the island terminates at a point with a hill which has received the characteristic name The Cap. That point forms the east side of another opening between Uvea and Ueneti Island, through which boats drawing 5 feet may pass at high water.

Ueneti Island is surmounted by flat-topped hills. To some of them names have been given which convey some idea of their form, such as Lion, Crown, etc.

Northern Pleiades.—The description of these islands and islets forming the western side of Uvea Bay commences at the northeast end of the chain and continues around the irregular curve to the southwestward. The first is a rugged mass of stone which, from some positions, resembles a tower; that is called North Head Islet. It stands up from a bed of sand which is connected with the Ueneti Island.

Whale Island is the second. Between it and North Head Islet there is no passage, the sea breaks right across. This island, when seen from a position 4 or 5 miles to the northwestward, represents moderately well a whale showing its back and part of its tail, also lifting its head out of water.

Tortoise Islet is the third, which when viewed from a distance justifies the comparison by appearing sufficiently like a tortoise. There are only bushes and a meager vegetation on this islet.

Whale Passage is between the island of that name and Tortoise Islet. The direction through is southeast by south and northwest by north. It is narrow, and has several heads of coral covered by about 4 fathoms, with deeper water between. The prevailing wind is generally straight out, and it is scarcely practicable for a moderate-sized smart sailing vessel, even drawing less than 16 feet, to beat through. On the outer side, opposite the west end of Whale Island, there are two coral rocks to be avoided. Their position is plainly indicated by the color of the water.

Small vessels when entering by this passage should give the preference to the side nearest Tortoise Islet, and, when in, steer toward Uadi Islet till within 600 or 800 yards of it, when the course should be direct for the anchorage off Uvea or Ashir village, avoiding a rock

with 2 $\frac{3}{4}$ fathoms water which lies about 100° and distant 1.6 miles from Uadi Islet.

Fatuba Islet, the fourth, is small, low, and flat. There is no passage for vessels on either side of it. Another flat lies between it and Pine Island.

Pine Island.—This island is easily known by two clusters of fir trees standing like columns near the center. It is the only island in this group on which fir trees were seen, therefore it can not be mistaken. The northwest side of this island is bordered by a reef about 200 yards wide, which is plainly seen by the color of the water, and the sea breaks on it when there is but little wind. At the edge of that reef there is a depth of 11 fathoms over a sandy bottom.

Uadi Islet stands a little less than 1 mile east of Pine Island. There are three heads of coral covered by about 4 fathoms off this islet. The nearest lies about 200 yards 44°, and the most distant $\frac{1}{2}$ mile 89°.

Bull Passage is between Pine Island and Lizard Islet. It is nearly 1 mile wide, 670 yards through in a 156° direction, 11 fathoms deep in the center (over white sand), and 5 to 6 $\frac{1}{2}$ fathoms at the sides, which are steep-to. There is a reef on the sea side of Lizard Islet and around the northeast end, where a detached rock stands on the reef. The tidal streams are strong in this passage, and with a fresh southeast breeze there is some swell and a short sea, which might prevent an unhandy ship from working in.

The next opening, between Lizard and Table Islands, is unsafe, the bottom being strewn with rocks which rise suddenly from deep water.

Anemata and West Passages.—The islands and openings farther west and south from the above are Deguala Island, The Twins, High Islands, and Anemata Island. The Anemata Passage is safe and about 3 miles broad. Its southern side is formed by a reef extending east and west for a distance of about 5 miles.

As with the prevailing southeast winds sailing ships have generally to work through the northwest passages, it would be better for such vessels to enter by one of the southern openings and to go out by the northwest.

Southern Pleiades.—The southern passages are Round Island, La Meurthe, Styx, and Coetlogon Passages.

Styx Passage.—To the northward of the reef which forms the north side of Coetlogon Passage there are two other reefs connected with it by shoals, and in a similar manner with the shoal which extends from Guetie Island. That island is nearly the same height as Muli, and is covered with bushes. At $\frac{1}{2}$ mile northwestward from

Guetie stands Gue Islet, which is of similar character. There is no passage between them.

At $1\frac{1}{2}$ miles 302° from Gue there is a third islet named Motuaini. It is lower than the two preceding and is joined to Gue by a continuous reef, on which, at about equal distances from the extremities, stand two rocks, named Mushroom.

Styx Passage, between Motuaini and Styx Islet, is about a mile wide between the reefs extending from those islets, and which are easily seen.

With a leading wind, which will be the ordinary condition, the passage is quite safe for any description of vessel. The water is smooth, and the passage being short it is cleared in a few minutes.

Coetlogon Passage is between the northwest point of Muli Island and a reef 200 yards long, which lies about 400 yards 336° from the said point, at the south extreme of Guetie Island Reef. That reef is covered by half a fathom over the heads of rock. It never uncovers, and the sea seldom breaks on it, therefore it is seen with difficulty.

Directions.—To enter Coetlogon Passage the reef off the west side of Muli should be rounded at a prudent distance, and as a leading mark the northwest point of Muli should be brought in a line with the southern foot of the west table hill on Wasau Islet bearing 88° . That line should be followed till the east point of Gue Island opens eastward of the east point of Guetie. The course will then be 83° or more northward toward the north side of the table hill on Lekin Islet, which is a short distance eastward of the north point of Muli.

That track leads about 200 yards from the point, which is steep-to and may be passed without danger.

This passage, which is excellent for steamships, might become dangerous to sailing vessels during calms or light winds, as they would encounter a strong current setting onto the reef.

Muli anchorage.—Vessels bound to Muli anchorage, after entering Coetlogon Passage, should continue to steer 83° till Muli Church (near the beach) bears 125° , in order to avoid the foul ground which borders the shore. The church should bear 179° and the anchor dropped in $5\frac{1}{2}$ fathoms at $\frac{1}{2}$ mile from the shore. This is the best anchorage the island affords; or at least, it is the position where a vessel can be nearer the shore than at any other. It is sheltered from winds between south-southeast and west-southwest. The bottom is sand mixed with broken coral, in which the anchor sinks entirely, but the holding power is only moderate.

Water.—The beach affords easy landing and water may be taken from wells which have been sunk at about 30 or 35 yards from high-water mark. It is always a little brackish, but least so during the falling tide.

Supplies.—Provisions of any kind are unobtainable at Muli. The inhabitants are very poor.

Lekin anchorage is opposite the village of the same name, at about $5\frac{1}{2}$ miles from Coetlogon Passage. It appears to be a good place for small vessels, which can anchor near the shore in about 3 fathoms, on sandy bottom.

Landing.—The beach at Lekin is convenient for landing from boats.

Wasau Lagoon.—Boats and small craft whose draft does not exceed 5 feet may find shelter in the lagoon. The entrance is between Wasau Islet and Cape Lekin, but it is only practicable at high water and when there is not much swell on the bar. It is best to run close along the cape. Within the lagoon there are many coral rocks awash.

Faiaue anchorage.—The Catholic mission house can be seen at a distance of 10 or 12 miles. The anchorage is not very good, as the bottom is dotted over with blocks of coral, especially to the northward of the church. Large vessels should not approach the shore nearer than 2 miles, and anchor in 6 fathoms. At that distance there is a rough sea during southeast winds. The holding ground is moderate.

Landing on the beach at Faiaue is easy, except during on-shore winds. Fresh water is scarce, but some provisions may be procured.

Faiaue is the most populous place on the island. There are missions; also a resident official.

Uvea (Ashir) village is situated on the northwest side of Uvea Island. The offing affords but a poor anchorage, as the bottom is hard; the rocks are only covered by 7 or 8 inches of sand, which can give no hold to the anchor, and dangerous heads of coral stand up from depths of 4 fathoms and less.

Vessels should not approach within $1\frac{1}{2}$ miles of the shore.

The shore is generally flat and bordered by a white sandy beach, but at Uvea it is less steep than in other places. When approaching the shore in boats carefully watch for rocks, as there are some on a level with the water.

Fresh water may be obtained from the wells near the Catholic mission church. Vegetables may be procured.

The native population about this village is considerable.

Beaupre Islands.—These five islands, northwestward of Uvea Atoll, and inclosing a lagoon, were discovered by d'Entrecasteaux, who named them after the celebrated nautical surveyor of the expedition.

The northwest side of the lagoon is formed of detached reefs. The entrance or entrances to the lagoon are on that side, and there is anchorage in 12 fathoms outside it.

Éo or Beaupré Island is the principal. It is entirely covered with coconut trees, with the exception of a small plain near the center of the southern part, where the bare coral is on the same level as the earth on other parts. The inhabitants belong to the Catholic mission at Muli on Uvea Atoll. They are in frequent communication with that island, of which the greater portion are natives. Their occupation is in preparing copra, which they send by country boats to Uvea, or load coasting schooners. They also cultivate yams, onions, cabbage, and other vegetables. Eggs, poultry, and pork may be procured in small quantities.

The largest boat can run her bow on a small, steep, sandy beach, while her stern will be in 6 or 7 feet. The only water procurable is from wells sunk in the sand near the beach, and it is brackish.

Simpson Reef.—It is supposed that the reef so named lies in latitude $20^{\circ} 49'$ S. and longitude $166^{\circ} 15'$ E., but its existence is very doubtful. It was first reported in 1846, in latitude $21^{\circ} 30'$ S. and longitude $166^{\circ} 50'$ E.; that is to say, in the channel so often passed by vessels belonging to the locality. As those positions are 54 miles apart, the reports evidently refer to two distinct places.

Gazelle Reef.—In 1864 the French schooner *Gazelle* reported dangerous breakers about 40 miles 66° of Yenghen. The state of the atmosphere did not admit of taking astronomical observations.

It was supposed for some time that the Gazelle Reef might be the same as the danger reported in October, 1842, at 17 or 18 miles farther to the northeastward, but *le Cher* passed over that position without perceiving a trace of a shoal. The existence of the Gazelle Reef is now doubted; nevertheless it will always be necessary to exercise caution and watch attentively when in the suspected neighborhood. It is marked P.D. on the chart.

Astrolabe Reefs lie 30 miles from Beaupré Islands and 60 miles from the nearest part of New Caledonia. They were discovered by Dumont d'Urville and examined by *le Cher* in 1884. Observations made on board *le Cher* placed the eastern reef between the parallels $19^{\circ} 53'$ and $19^{\circ} 48'$ S., also between the meridians $166^{\circ} 0'$ and $165^{\circ} 52'$ E. The western reef is between $19^{\circ} 43'$ and $19^{\circ} 53'$ S., also between $165^{\circ} 38'$ and $165^{\circ} 32'$ E.

On the following day the same vessel passed round the south and east side of the western reefs, which are two in number, distant from each other $2\frac{1}{2}$ miles. Shoals having from 6 to 9 fathoms extend $\frac{1}{2}$ mile north from the southern reef and $\frac{1}{2}$ mile south from the northern part, leaving between them a channel about 100 yards wide, with depths of 22 fathoms, but strong eddies were found there.

Except some heads of rock and small sand banks which were covered at high water no trace could be found of the islet which was

seen by Dumont d'Urville at a distance of 2 miles. After passing close round the north end of the northern reef, and failing to find an entrance to the lagoon, *le Cher* anchored in 22 fathoms, fine sand, at 600 yards from the sunken reef. The anchor held well during a stiff breeze from southeast. That position is protected from the sea throughout the eastern semicircle, and a detached reef to the southwest breaks the sea in that direction. After leaving that anchorage, a rock, nearly awash, was found on the north side about 600 yards from the edge of the principal reef.

Tide and tidal streams.—At the anchorage 336° from the north point of the south reef the time of high water, full and change, coincides exactly with the time at Noumea, or 8h. 25m. The maximum rate is 1.2 knots an hour, the ebb running east-northeast and the flood west-southwest.



CHAPTER IX.

NEW HEBRIDES ISLANDS—ANEITYUM, TANNA, ERRONAN, ANIWA, EROMANGA, EFATE, EPI, AMBRYM, MALEKULA, ARAGH ARAGH, AOA, AURORA, ESPIRITU SANTO.

Geological formation.—The geological structure of the islands of the New Hebrides Group differs considerably; some are entirely volcanic, others are of coral formation, while several are a combination of these two.

On the east side of Tanna Island there is an active volcano, the cone of which is formed almost entirely of scoria and dust. Though in constant activity for many years, there is very little lava to be seen. In 1890 the crater was about 300 feet deep, divided by a rocky partition about 100 feet high, on each side of which were orifices, three on one side and two on the other, in which the molten materials were bubbling with a subdued roaring sound. At intervals of a few minutes violent explosions threw the molten scoria to a height of 100 to 300 feet above the summit of the crater, most of which fell back again. During these explosions clouds of sulphurous fumes rose from the crater and many yards outside the lip. The inner sides of the crater are very steep and not infrequently fall in, therefore it is dangerous to stand near the brink.

Efate Island is chiefly of coral limestone formation, rising into ridges and well-defined peaks in the northwestern part, the highest of which is 2,203 feet. In many parts the island has the appearance of terraces one above the other, denoting distinct periods of upheaval. This formation is most noticeable in the vicinity of Havanah Harbor. These terraces are all of coral formation, and masses of madrepores, meandrinæ, astreæ, and fungi are to be found, perfect in shape, embedded among deposits of lime and coral detritus. Coral was found at Efate on the remarkable height of 1,500 feet above the sea.

Off the northern side of Efate are the smaller islands of Nguna, Pele, and Mau, which are of volcanic origin, with inactive craters on Nguna and Mau, but as far as could be ascertained from the natives there are no traditions as to when they were active. This volcanic formation extends to the south side of Undine Bay, there being frequent evidence of igneous rocks on and about Fatmalapa Hill.

Moso, Leleppa, and Erradaka Islands, on the northwest side of Efate, are all of coral formation, but on the sea face of Leleppa are some strata resembling soft sandstone near the bottom of the cliffs under a stratum of 50 or 60 feet of coral limestone, and in another place there is a large cave where the soft stone appears to extend to the surface, as if during an upheaval the upper crust had been fractured and the soft stone forced through. Some of this soft stone was also found at Baffling Point at the sea level, on the opposite side of Hilliard Channel, which is 150 fathoms deep at this section.

Mataso is a small island of volcanic origin. The northern peak is 1,643 feet high. The smaller hill is 465 feet high, with a rich red soil on which vegetation grows luxuriantly. There is but little coral growing round the base of the steep hills, but on either side of the beach connecting them there is a narrow fringing reef.

Makura Island is also of volcanic origin. There are large boulders at the foot of the steeper sides and a narrow fringing reef off its western extremity.

Mai Island is formed of three high cone-shaped hills, entirely volcanic, and is surrounded by a fringing reef. No coral was found elevated above the sea level, but on the west side of the island there is evidence of a beach some 50 yards inside the edge of the thick trees and bushes, with coral showing here and there on the same level as the present beach.

The Shepherd Islands are all volcanic and apparently of recent formation. No coral was found growing round the shores of any of the islands nor on the adjacent coast of Epi. Native tradition states that a great earthquake and disturbance took place about 250 or 300 years ago, when these islands, which then formed part of Epi, were broken up into their present form. Their general appearance and relative position add weight to this report. Near the north-east point of Tongoa is an open space of about 25 acres where the ground is heated almost to boiling point; steam and vapor rise in several places and the natives cook their food in holes dug for the purpose. Round this hot ground coconuts, palms, and other grow luxuriantly.

Malekula differs very much in formation from those islands already mentioned, the greater part of it being decomposed volcanic rock or sandy claystone. At first sight it appears of similar formation to Eromanga and Efate, with its even-topped hills and rapid descent to the coast; but a closer acquaintance shows that these hills are much broken up with ravines and gullies. Near Port Sandwich there is a quarry 400 feet above the sea, and the Frenchman who works it states that all this part of the island is formed of decomposed volcanic rock. No coral was seen in any elevated position near

the south end of the island, but near Port Stanley it was found at a height of 500 feet above the sea.

From the soundings already obtained it appears that the New Hebrides are probably situated on a bank which is submerged 350 to 400 fathoms, running in a north by west and south by east direction, with a deep channel between it and New Caledonia.

Population.—At the end of 1898 the population was estimated to number 70,000.

The natives throughout the group are fairly quiet toward strangers, though fighting among themselves. Occasionally the labor vessels are fired upon.

Communication with Australia is maintained by one of the Australian Union Steam Navigation Co.'s vessels from Sydney, monthly to Havanna Harbor or Fila, on their passage to Fiji. A small French steamer from Noumea also visits the group monthly, calling at Fila, Havannah Harbor, Ringdove Harbor, Port Sandwich, Marina Island, and Pekoa or Segond Channel, in addition to an interisland service, as a steamer visits all the islands and meets the Australian Union Steam Navigation Co.'s steamer at Fila.

Mission.—The Presbyterian mission has been established for many years on the islands; also, there are stations of the Melanesian mission. Owing to the influence of the missionaries communication with the natives has been much facilitated.

Many languages are spoken in the group, and consequently an interpreter, however efficient at any one village, is nearly sure to be useless elsewhere.

Anchorage.—The best harbors in this group are Port Aneityum, in the island of the same name; Havannah Harbor, in Efate Island; and Port Sandwich, in Malekula.

Anchorage are numerous on the western sides of nearly all the islands.

Discolored water.—The master of the steamer *Henley* reported having passed discolored water, at a distance of $1\frac{1}{2}$ miles, in the approximate position latitude $19^{\circ} 3' S.$, longitude $171^{\circ} 41\frac{1}{2}' E.$ A cast of the lead at 100 fathoms gave no bottom, and this apparent danger was not examined. "Discolored water reported, 1906," has been placed on the chart. A report in 1912 states that the British steamer *Strathspey* passed over this position and saw no sign of shoal water.

Aneityum (Annatam) Island is 9 miles long in an east-and-west direction and 6 miles broad north and south. The western peak, 2,788 feet (the saddle), is the highest. When the island is seen from a distance either north or south it appears like two small islands; from the east or west it presents but one mountain.

The deep-sea lead will give warning of approach, as the bank of soundings extends 2 or 3 miles from the shore, except on the west and north sides, where it only extends about half that distance from the shore reef. The eastern side is the only part which is not fringed by a coral reef; at the other parts the reefs generally join the shore.

With the exception of Efate, it appears to be the most cultivated island in the group, being entirely under the control of the Presbyterian mission.

There is a variety of good timber on the island, the damara or kauri pine and the tamanu, a wood resembling mahogany, being conspicuous.

The north coast of Aneityum has several small bays, but they afford no good anchorage in southeast winds. Port Patrick, near the middle of the north coast, is the principal, but is only fit for small vessels. Near it is Aname, where there is a mission station.

From the point which forms the east side of Port Inyeug or Aneityum a reef extends off $1\frac{1}{2}$ miles southwestward, on which stands Inyeug Islet more than a mile offshore; also bearing southwest from the saddle-topped mountain lies the detached reef Inmahie, more than 1 mile in extent north and south.

The principal ports in Aneityum Island are connected by telephone.

Port Aneityum or Port Inyeug, on the shore of which is the village of Anelgauhat, by which name the port is commonly known and where the mission station is situated, is on the southwest side of the island, and is formed by an offlying coral reef lying $1\frac{1}{2}$ miles offshore and nearly 2 miles in length. It is easy of access, but open to westerly winds, and can only be considered safe for sailing vessels from April to October, during which time the southeast trade wind blows steadily.

On the side of the hill facing the harbor two wooden boards have been placed. They are painted white with black vertical stripes, and when in line lead into the harbor midway between the reefs. In 1901 Mr. Wilson, a trader, placed lights, red and white, as leading lights, when a vessel was observed making for the harbor after dusk, but they are not to be depended on. As the leading beacons are difficult to distinguish it, is recommended to keep Flat Rock just open of Coconut Ridge Point, bearing 100° . It is advisable to moor with open hawse to the westward when the wind is expected from that quarter; the squalls are sometimes violent.

Observation spot, on Inyeug Islet, is in latitude $20^{\circ} 15' 17''$ S., longitude $169^{\circ} 44' 44''$ E.

Tides.—It is high water, full and change, at Port Aneityum at 6h. 35m.; springs rise 4 feet.

Discolored water was observed to extend nearly 1 mile to the southward of Flat Rock near the southeast end of Aneityum.

Earthquakes.—Severe shocks of earthquakes are occasionally felt.

Immahie Reef lies 1 mile offshore at $2\frac{1}{2}$ miles northwestward of Port Aneityum, with shallow heads between it and the shore. It is nearly awash.

Coast—Anuo Uno Pul.—The entrance to this cove on the west side of the island is wide and free from danger; the saddle peak bears from it 117° .

Anau Un Se.—Saddle Peak bears about 134° from the entrance to this cove, which is formed by an opening in the coral reef which surrounds the shore; the width of the entrance is not more than 140 yards, and it is 16 fathoms deep. The available space inside is only 200 yards in width, and at 500 yards within the entrance there is a depth of 3 fathoms. The anchorage is in 6 or 7 fathoms, sand and coral, 250 yards from the shore. It is only suitable for very small craft and is exposed to the northwest.

Ijyphav or Ejeptalve.—Saddle Peak bears 168° from this cove, which is larger than the preceding. It is formed by a considerable recession in the coast line and an opening in the coast reef, which combined inclose a length of about 1,100 yards in a 167° direction and a width of about 400 yards at a similar distance from the head of the bay. Anchorage may be taken at 200 or 400 yards from the shore in 4 or 5 fathoms, sand and mud.

Landing is difficult, as the shore is bordered by a coral flat, which, though extending but a short distance out, prevents the passage of boats. Fresh water may be procured at the southwest side of the bay.

Port Patrick is situated about $2\frac{1}{2}$ miles eastward of the last-mentioned cove and about the center of the north coast of the island. It is formed on the east and west sides by detached coral reefs and on the south by the high shores of the island. The outer part of the entrance is more than 600 yards wide between the 5-fathom curves. Saddle Peak bears from the entrance 215° . The course thence must be directed toward the eastern side of the bay, in order to pass eastward of a detached reef forming the western point of the inner entrance. This passage is less than 150 yards wide.

It is recommended to steer in with a prominent red bluff, having a gray face, in line with the middle of a valley under a high hill, bearing 184° .

The anchorage is to the southward of the detached reef, between it and the shore reef, in 10 to 12 fathoms. The bottom is uneven, there being some holes with 20 fathoms. The space for anchorage is contracted by the reefs, and though well protected it is only suitable for small vessels, and that with the assistance of the chart.

The missionary's house is on the observation spot point and a white-painted church has been built 80 yards to the westward of it.

The *Phæbe* anchored with this church bearing 210° and the northern edge of the western reef 290° in 18 fathoms, sand, shell, and coral.

At 2 miles eastward of Port Patrick there is a large bay formed by a bight in the coast reef. It is open to the north and northeast, but affords an anchorage during westerly winds in 13 to 16 fathoms, with Saddle Peak bearing about 241° . Communication with the shores of the bay is rendered difficult by the bordering reef.

Erronan (Futuna) is about 2 miles in length and the same in breadth, with a table top 1,931 feet in height. Its southeastern point is foul to the distance of 400 yards, and its east point to 200 yards; elsewhere it is apparently steep-to.

When approaching from the southward in a sailing vessel, pass around the east end of the island. The water in Herald Bay and to leeward of Northeast Point is so deep that large vessels had better keep under way, whether by steam or sail.

Westward of Northeast Point are situated three sandy beaches, of which the western is the smallest and is easily recognized.

Vessels can obtain indifferent anchorage off the mission station, in a depth of 24 fathoms, by steering with the western beach in line with the northeastern side of the Table top, bearing 176° , and anchoring when the summit of the knoll over Northeast Point bears 78° .

Inshore of the position the depths rapidly decrease.

Landing.—There is a good landing place in a very small cove on a sandy beach under the missionary's house, westward of the north-east extreme of the island.

Current.—On the east side of the island the current sets to the southeast and south at the rate of 1 to $2\frac{1}{2}$ miles an hour, while on the west side it runs to the north or northwest.

Tanna is about 20 miles in length north and south, with an average breadth of about 8 miles, and in most places its shores are fairly steep-to. Its summit, Mount Walt, is 3,200 feet in height. The east side of Tanna, which island lies about 35 miles northwestward of Aneityum, is covered with thick forest, clothing the hills from base to summit. On the west side the land runs down in a continuous slope from a cone-shaped mountain in the interior to the west point, which is low, a rocky spit projecting westward from it, with breakers to seaward, probably $\frac{1}{4}$ mile from the shore. Large tracks of nearly level country are to be seen on the west coast covered with thick coarse grass. To the southward of the west point the coast line is low, with several sandy beaches. The hills of the north coast are about 1,200 feet high, bounded by perpendicular cliffs, and destitute of trees; the low land at their foot is, however, thickly wooded.

The approaches to Tanna appeared safe, rocky spits stretching out from most of the points, but few for a greater distance than 200

yards. A strong tide rip was seen off the northeast point of the island.

The natives of Tanna were very warlike in former days, but they have probably come under the peaceful influence of the missionaries.

Whitesands.—This mission station, situated about 3 miles northwest of Port Resolution, is difficult of recognition, as the houses are hidden by trees.

Beacon.—A white beacon, with topmark in the form of a cone, has been erected on the shore.

Anchorage.—Vessels should steer in with the beacon bearing 255° and anchor in a depth of about 12 fathoms at 600 yards from the shore with the mission house bearing 280° . The best landing place is close northward of the beacon.

Volcano.—An active volcano destitute of vegetation (Mount Yasua), having two distinct craters, is situated in the southeastern part of the island.

Port Resolution, situated at the eastern end of the island, was named by Cook after his vessel.

A vessel from the southward may pass the port without distinguishing the entrance in consequence of the surf from the east side spreading across it. There is a remarkable perpendicular cliff terminating a barren hill of reddish yellow sandstone at the northwest angle of the port, which is the best landmark, as the volcano is sometimes in the clouds. The cliff is above some projections or irregularities in the ground, which gives it the appearance of a ruin when seen from a distance.

Cartaret Point is unmistakable, it is low with a sandy beach and a rock above water off the end; it is also covered with trees.

The smallest and also the southern peak in the southeast range bearing 212° leads into the port about mid-channel.

Anchorage.—Small vessels will find secure anchorage at the inner part of Port Resolution, southwestward of Resolution Point, in $4\frac{1}{2}$ fathoms. The space between the reefs where that depth is found is about 200 yards wide. The channel leading to Resolution Point has a depth of $3\frac{1}{4}$ fathoms.

Large vessels may anchor in the entrance during southeasterly winds, in 7 or 10 fathoms, only going far enough in to receive protection from Carteret Point. A northeasterly wind or a strong trade wind sends in a heavy swell. It would be difficult for a sailing vessel to work out. Strong trade winds spring up during the forenoon and subside at sunset. The volcano is about $1\frac{1}{2}$ hours' walk from Resolution Point.

Supplies.—A few fowls, goats, yams, taro, oranges, lemons, and guavas are obtainable, current coin and the ordinary articles of barter, viz, beads, fish hooks, tomahawks, etc., being taken in exchange.

Tides.—It is high water, full and change, at Port Resolution at 5h. 35m.; springs rise about 3 feet.

Baie du Soufre (Sulphur Bay).—To the northwestward of Port Resolution there is a large bay which has not yet been examined, but it appears to be free from danger. It is at the foot of the volcano and was so named because some sulphur was found in the vicinity.

Wea Sisi Bay, situated 6 miles northwestward of the entrance to Port Resolution, east side of Tanna, affords a snug anchorage during the prevailing southeasterly winds, but is a disagreeable place to be at, on account of the ashes which fall from the volcano to windward.

The English mission house is hidden by trees to seaward.

Those approaching the coast, wishing to anchor here, should keep the western high peak of Tanna on a south bearing. As the coast is neared the bay may be recognized by its beach of black sand and by the sloping hill at Ingofu Point that forms its northeast corner. Stand in on the south course until a rock with trees on it comes into view, which steer for.

Small vessels will find good anchorage in 4 fathoms, large vessels in 7 fathoms; black sand.

Ingofu Point, in line with the bluff to the eastward of it, is a good mark for the outer anchorage.

Breakers have been observed off Nunalu Point (to the westward of Wea Sisi Bay), but have not been examined.

Lenakel anchorage (Fejian Bay) is situated on the west side of Tanna.

The highest peak of the island, bearing 106° , will lead from the offing toward the anchorage.

Worthington Point, situated 1,200 yards westward of the trader's house, is conspicuous.

The mission house is on a hill conspicuous from seaward. The roof of the planter's house is also visible, and these will serve to identify the anchorage.

Good anchorage may be found during south by east winds with the mission house bearing 77° and the end of the trees on the north point of the bay 325° , in 14 fathoms, black sand. The anchorage is probably fairly good from April to November during the season of the regular southeast trade.

A sunken reef lies 300 yards offshore and 500 yards southward of the planter's house, and coral reef fronts the shore to the distance of 600 and 400 yards north and south of Boat Cove. Others may exist, as the anchorage has not been thoroughly examined.

Overigo is a village $2\frac{1}{2}$ miles southeastward of Lenakel. It is marked by a large black rock, and good anchorage in 9 fathoms was

found 250 yards from this rock, with easy landing during southeast winds.

There is a Presbyterian mission station at Kwamera, at the south end of the island, and about 7 miles from Overigo. Anchorage was found 250 yards from this rock, with easy landing during southeast anchorage all along the coast between it and Lenakel or Sangalie.

Black Beach Bay or Lonanloma is an open bay situated on the northwest side of Tanna. Good water is obtainable. Should a swell, however, set in from north or northwest a sailing vessel should immediately put to sea, as it is the forerunner of the wind setting in strongly from that quarter.

The two points which form this bay lie 16° and 196° from each other, and the coast line between them recedes 2 or 3 miles. The north point is formed of high land terminating abruptly and the south point descends to the sea by a gentle slope.

The name Black Beach is improperly applied, as there are not more than two small portions of the shore which are covered by black sand, the remainder is divided by ordinary colored rock into several patches of beach covered by white sand. Off the south point there is a small reef upon which the sea breaks.

This bay is easily recognized by its opening to the northwestward and by a large gap in the hill behind the central part.

Anchorage.—A sailing vessel unable to work up against the southeast wind may take shelter in this bay, there being no serious danger except with winds from northwest to southwest, to which direction it is completely open. The best position for anchoring is a little to the right of the gap in the hill and to the southward of the larger and southern of the two patches of black sandy beach, which are plainly seen at a distance of 2 or 3 miles. The following bearings were taken at the anchorage: Center of the beach 89° ; the south point of the bay 210° , and the north point 4° . The depth about that part is from 16 to 22 fathoms.

Water.—There is a small watering place near the beach.

Shoal.—A shoal patch with a least depth of 2 fathoms lies 2 miles 212° from the northwest point of Tanna. Being in smooth water, this patch does not break.

Aniwa Island (Immer or Nina), situated about 13 miles 79° of the northeast extreme of Tanna Island, is about 2 miles in length and from 120 to 150 feet high. It is well wooded, the south point terminating in a small bluff, while the north end is very low and extends a considerable distance seaward. It is totally devoid of good anchorage.

Mission.—The inhabitants are closely connected with the people of Tanna. The mission station is at Ipau, near the north end of the island, where a small supply of provisions may be procured.

Discolored water was reported to extend in a northwesterly direction from this island for a distance of about 2 miles; caution is therefore necessary when approaching it.

On the west side of the island several small reefs were seen to extend about 400 yards from the shore.

Eromanga, situated about 25 miles northward from Tanna, is about 25 miles in length north and south, with an average breadth of about 10 miles, and has three peaks ranging in height from 2,500 to 3,000 feet. The southern coasts of the island are bold and most of its shores are steep-to. It possesses no good harbors, but anchorage may be found in Dillon Bay on the west side, and Polenia, Narevin, and Cook Bays on the east.

The southern side of the island is densely wooded, the white limestone cliffs showing here and there between the trees. On the west side a narrow belt of lowland borders the cliffs, having on it groves of coconut palms. The coast hills have but few trees on them, being covered with short wiry grass, but the distant mountains are clothed with forest to their summits.

The foreshore and most of the terraces consist chiefly of coral limestone, showing considerable symptoms of upheaval, with here and there a black volcanic rock.

Traitor Head, on the eastern side, is remarkable for having on it three of the highest hills on the island (2,700 feet).

The British naval vessel *Phæbe* reports the southwest coast of the island from $1\frac{1}{2}$ miles south of Dillon Bay to be charted too far to the southwestward.

Natives.—The natives of Eromanga are said to be singularly treacherous and superstitious; no less than five missionaries have been murdered at various times.

Supplies.—Coconuts, sugar cane, breadfruit, etc., can be obtained from a good boat harbor near the southeast extreme of Eromanga.

Current.—A strong westerly set has been experienced between Eromanga and Sandwich Island during the southeast trade.

Elizabeth Bay, on the west side of the island, may be recognized by a large plantation with a white house built upon it.

This bay can not be recommended as an anchorage for a sailing vessel, being exposed to westerly winds, and having a depth of 14 fathoms, sand and coral, within 200 yards of the shore.

Dillon Bay.—The position may be known by a deep gap in the hills, the trend of the coast, and the south point of the bay descending toward the sea by four distinct terraces; also by the Presbyterian mission station on the north point of the river entrance, the houses showing to seaward.

An earthquake and seismic wave were experienced here in March, 1875. The latter rolled large boulders onto the beach and altered

the depth and direction of the entrance to the river, which has, however, since silted, so that it will not now admit of the passage of an ordinary ship's boat at low water. In 1908 it was reported that 2 fathoms less water was found than is charted.

The bank which affords anchorage extends about 600 yards distance from the shore, beyond which it is steep. It appears to have been formed by the deposit from the river.

Beacons.—Two white beacons have been erected on the north point of the river, southward of the mission, and when in line bearing 100° lead to the anchorage. If a vessel is expected or sighted at night, the missionary stationed here places a white light on each of the beacons. There is a good position off the mission house, about 600 yards from the shore, in about 10 fathoms. good holding ground, with the beacons in line, and also farther northwestward in 15 fathoms. A strong westerly wind causes a heavy sea at the anchorage, which might occur at any time between November and April. There is a deep hole (52 fathoms) nearly 800 yards 269° from the south point of the river; therefore that bearing should be avoided.

It is high water, full and change, at Dillon Bay at 5h. 30m.; springs rise 4 feet.

Polenia Bay, on the east coast of Eromanga, is about 8 miles wide and recedes 2 or 3 miles within the straight line. Traitor Head, which forms the southeast limit of Polenia Bay, is bluff near the outer part, but the summit behind it, in the form of a saddle, decreases in height toward the interior and terminates in small hills. All the west side of Polenia Bay is planted with coconut trees.

Traitor Head affords good shelter to the bay during the southeast trade wind. Capt. Cook anchored off the head in 17 fathoms, brown sand, at $\frac{1}{2}$ mile from the shore, with the extreme of Traitor Head bearing 162° and High Rock (Goat Island) 55° .

Goat Island (High Rock).—A high rocky islet stands 5 miles 44° from Traitor Head. Its rocky sides are precipitous, with deep water all around it. It is covered with trees, but uninhabited. Landing is almost impossible.

Port Narevin or Walter Bay lies within Traitors Head at the southwest part of Polenia Bay. It is about 1,600 yards wide between the points, and recedes from the reefs on each side 600 yards. There is a clear space of 1,000 yards between the reefs at the entrance, with a gradually shelving bottom.

There is anchorage, in 6 fathoms, at about 600 yards from the reefs on either side, and from the beach, protected from easterly winds round by south to northwest, but exposed to the northward.

The outer edges of the reefs are steep-to, and the sea breaks on them. A slight swell enters the bay when the wind is strong outside. Boats will find a natural cove formed by the reef at the southeast

end of the bay and where there is a boathouse. The passage is marked by a rock above water on the port hand, and by a patch of rock on the starboard hand which the natives sometimes mark with a bough of a tree. Landing would be difficult in any other part, as the beach is fronted by rocks.

Lights.—Two vertical white lights are exhibited when a vessel is sighted at night.

Vessels should steer in with these lights bearing 179° , and anchor in a depth of 9 fathoms.

Cook Bay is a broad and deep indent in the coast line, commencing on the south side of Traitors Head. The shores are low and the adjacent land appears to be fertile, as it is covered with a thick forest. It is exposed to the prevailing southeast trade and has not been explored.

When the French cruiser *Sécond* was leaving the bay (in March, 1879) and Traitors Head bore 359° (distance not given) the bottom was seen under the vessel, but the shoal spot was passed before there was time to heave the lead. The vicinity of the point should be avoided.

The master of the schooner *Ariel* reported the existence of a $2\frac{1}{2}$ -fathom shoal in Cook Bay, with Traitors Head 41° distant 1 mile. It generally has blind rollers, and breaks heavily in bad weather.

Efate (Sandwich Island)—**General remarks.**—Efate is one of the most important of the New Hebrides Group, having two excellent harbors and being the headquarters of trade, but the soil is not so rich or productive as in many of the islands farther to the northward.

Efate Island, which is 25 miles long east and west and 18 miles north and south, is principally formed of coral, and from the steep cliffs and terraces to be seen in many parts, must have been subject to violent upheavals at distinct periods.

The northwestern part of the island is the most elevated. Mount Macdonald rising to a height of 2,203 feet, and several other mountains nearly as high. The slopes and ridges drop rapidly on the northern side of the island, but stretch away in long spurs to the southeastward, so that viewing the island from the southward it does not present at all an imposing appearance, the gradient being so slight and giving an impression that the island is comparatively low. Most of the hills are covered with trees to their summits, but the table-land between Meli Bay and Havannah Harbor is covered with long coarse grass.

This island is fairly well watered, but the porous nature of the coral absorbs a large part of the rainfall before it has time to fertilize the soil. The rainfall probably exceeds 60 inches in the year.

Landmarks.—On approaching Efate from the southward or westward Vanua Tap, a hill overlooking Fila Harbor, will present a

good mark. while the summits of a long serrated ridge in the middle of the island are very conspicuous. The hill at its southeast extremity, 1,300 feet high, terminates abruptly at the side of the valley.

The points on the south and east sides are long and low, so that it is difficult to distinguish them at night, but fortunately the shore reefs do not as a rule extend far from the coast line.

Tides.—The tidal observations made at Efate by the British naval vessel *Dart* show that in July, August, and September the day tides fall lower than the night tides. In October the day and night tides alternated in each lunation, while in November the night tides fell lower than the day tides.

The currents in the vicinity of Efate Island are not very regular, but may generally be found running with the prevailing trade wind from $\frac{1}{4}$ to $\frac{3}{4}$ knot an hour. At times, however, they were found to be setting to the eastward, though not strongly.

Settlements.—The majority of the traders and settlers are living in the vicinity of Meli Bay and Fila Harbor, where there is plenty of level land for cultivation. Coffee, bananas, maize, and coconuts yield excellent crops.

Missions.—The only missionaries on Efate are those belonging to the Presbyterian Church. They have a station on Eraniau Island at the entrance to Erakor Lagoon, another on White Sand Point, Havanah Harbor, and a third on the southeast point of Nguna Island, lying off the north side of Efate, while there are native teachers and schools in most of the principal villages.

The missionaries have a great influence with most of the natives, who are nearly all under the teaching of Christianity. The result of this is that it is perfectly safe to travel anywhere about the island without fear of molestation, but only receiving kindness and hospitality from the natives, and it is quite a rare sight to see any of them carrying weapons, spears being only used for catching fish. The natives everywhere were found to be honest and always ready to assist in any way, acting as guides, etc.

South coast.—Narapo Point, the southern extreme of Efate and the eastern extreme of South Bay, is low and covered with trees to the water's edge. It is fronted by a narrow fringing reef which is steep-to.

South Bay is $1\frac{1}{2}$ miles long north and south and $\frac{1}{2}$ mile wide. It is deep up to the head, where there is a sand beach backed by a valley which extends into the middle of the island. There is also a small river which enters the bay at the western end of the beach.

The best anchorage, with protection from all winds except between south and southwest, is to be found in the northwest corner of the bay, in 8 fathoms, sandy bottom, about 300 yards from the beach.

The British naval vessel *Dart* anchored here for the night on two occasions, and each time it was observed that the place seemed unhealthy. Not only were the mosquitoes especially troublesome, but many of the crew were tired and feverish in the morning.

Coast.—From Tapis Point, the western entrance of South Bay, the coast line to Etmat Point is much broken, forming several inlets. Kapuma, a low islet, is 1,600 yards 297° from Tapis Point. It is covered with trees and fronted by a reef to the distance of 400 yards. It is connected with the mainland by a reef.

There is no channel between Tapis Point and Kapuma, except for boats, as a coral reef extends across, the middle part of which is nearly awash at low-water springs.

The eastern part of the bay within the boat channel is encumbered with reefs and the shore line is broken up with mangroves and shallow lagoons. On its eastern side is an island named Waratap, which gives its name to the surrounding district. There is a village and schoolhouse on the island.

In the bay $\frac{1}{2}$ mile west of Kapuma Islet there is a small reef which always breaks, and there is a patch of 2 fathoms between it and the islet. The bights between the points at the head of the bay are almost entirely blocked with reefs, and a rock with only 5 feet over it a low water lies 600 yards north of the breaking reef.

Temporary anchorage may be obtained in 17 fathoms, sand and coral, inside the breaking reef, which affords a little shelter from the southeasterly swell about midway between its western extreme and the rock.

Etmat Point, which has a white sandy beach, is low and well wooded.

Ennis Point lies 2 miles 302° from Etmat Point, and between is a bight extending nearly 2 miles to the entrance of Erakor Lagoon. The head of the bight is blocked by a reef on which is Eraniau Island, where there is a Presbyterian mission station; but none of the buildings or huts can be seen from seaward, being situated in the bend on the eastern side of the island.

Almost in the middle of this bight is a patch of foul ground with a depth of 3 fathoms in one part, and as the sea does not break on it except with southerly or westerly winds, care is requisite when approaching the mission station.

Erakor Lagoon can only be used by small boats which have been able to cross the reef at its entrance.

Meli Bay is a deep indentation on the southwest side of Efate Island, $4\frac{1}{2}$ miles wide at its entrance, and recedes 5 miles. Pango Point, on the eastern side of entrance, is the extremity of a strip of low land thickly covered with trees. There is a ledge of rock extending a short distance beyond high-water mark, which is steep-to.

Pango Point may be recognized by the ridge of hills, 489 feet high, extending eastward from it.

Great care should be taken not to mistake Pango Point for Etmat Point.

From Pango Point the coast trends northeastward nearly 3 miles to Fila Harbor, and is fronted by a narrow fringing reef free from outlying dangers. At $1\frac{1}{2}$ miles from the point and 400 yards back from the shore is a small isolated mound 240 feet in height, which is a conspicuous object as it rises from a flat plain.

Fila Harbor is situated on the east side of Meli Bay and affords excellent shelter from all winds except westerly for all classes of vessels; but unfortunately the depth of water in the most sheltered part of the harbor is 20 to 29 fathoms, which is rather deep for anchoring, but the depths are less northeastward of Fila Island.

The harbor may be described as being nearly square in shape, 1.3 miles north and south by 1 mile wide. The bay or inlet on its north side, 1,600 yards in length, is only accessible to boats, on account of a barrier reef which extends across its entrance, nearly awash at low water.

The entrance of Fila Harbor is between Malapoa Point and Fila Island, but as the reefs extend some distance from the shore on either side, the width of the channel between the 5-fathom lines is reduced to 450 yards.

The soundings at the entrance of this harbor are very irregular, the bottom being of coral. Only 900 yards outside the narrowest part of the channel 100 fathoms may be obtained.

The part of the harbor north of Iririki Island has a very uneven bottom, and the place which would have been the best anchorage is spoiled by a coral patch with only 12 feet water over it, lying in the middle.

Light.—From a white wooden pyramid, 10 feet in height, erected on the northwestern coast of Iririki Island, at 100 yards northward of the northern flagstaff, is exhibited, at an elevation of 16 feet, a fixed green light, visible from a distance of 3 miles.

Leading lights.—The front light is shown from a white mast 30 feet in height, and is visible 9 miles.

The rear light is altered from fixed white to fixed red, and is visible 9 miles. It is shown from a small white square wooden box.

Beacons.—A beacon marked by a broad vertical black stripe is erected behind each of these lights.

Fila Island.—The western side of the harbor is formed by Fila Island, of elevated coral formation, and covered with trees. An extensive reef, which is nearly awash in parts at low-water springs, connects Fila Island with the land to the southward under Vanua Tap,

but boats can cross this reef and enter the harbor by a shallow channel 120 yards wide, between the island and a low woody projecting tongue of land at the foot of the hills.

The northwest side of Fila Island consists of sand beaches and broken coral cliffs, with some high detached rocks, and fronted by a broken reef which extends more than 400 yards seaward, with shallow water beyond for about 200 yards. The northern side of the island consists of steep inaccessible coral cliffs 40 feet high, with a narrow fringing reef extending 100 yards from the shore. The eastern side has a long stony beach, behind which there is a large village hidden among the trees.

Government.—Fila is the seat of government of the New Hebrides. The British and French commissioners reside here.

The British residency is on Iririki Island, and the French near the front landing beacon.

Port of entry.—Fila is the sole port of entry, and all vessels entering the group are to report first at Fila, to the respective resident commissioners.

A mission church is situated on Fila Island at about the center of the bay at the northeast and forms a useful mark for picking up the 10-fathom patch to anchor on.

The south side of the harbor is a bold rocky shore backed by steep and densely wooded hills. The greater part of the eastern side is also steep, and 600 yards northward of the southeast corner is a remarkable white cliff. The northeast coast is lower, with several sandy beaches, behind which the land is cultivated and there are some houses.

Pier.—On the eastern side of the northern part of the harbor a substantial stone pier with tramway has been built to facilitate shipping the coffee and other produce grown in the vicinity, and a large drying house and store. A long low white building, very conspicuous from seaward, is situated just behind the pier.

Malapoa Point, which is the northern side of the entrance to the harbor, has a sandy beach, behind which there are some thickly wooded slopes, and it is fronted by a flat coral reef, the greater part of which dries at low water. Extending 400 yards southwestward beyond the reef there are some coral heads and shoal water for another 150 yards.

From Malapoa Point the coast turns northwestward with a sandy beach fronted by a broad belt of coral reef. At 600 yards from Malapoa Point there is a coral rock 15 feet high, standing 40 yards in front of the beach, forming a useful object when making the harbor.

Iririki, situated in the eastern part of the harbor, is a coral island 187 feet in height, covered with trees. Its western side is fronted by

a reef which dries in patches near the shore, and has numerous coral heads with from 1 to 2 fathoms between them, extending about 200 yards from the shore. A long spit extends from the low south point of the island and connects to the shore on the south side of the harbor by a reef which has many coral heads nearly awash at low water. This reef divides the southern part of the harbor into two distinct basins. In the west part there are from 20 to 29 fathoms and in the east part 21 to 25 fathoms. The latter is only accessible to boats.

Off the northern end of Iririki a reef extends about 200 yards with several coral patches nearly awash; and from the northeast corner of this reef a ridge of coral rocks with 1 to 2 fathoms between them extends across to the eastern shore, blocking the northern entrance to the eastern inlet. The southern entrance is blocked in a similar manner, consequently there is no channel into the deep water inside Iririki Island, though doubtless small coasting vessels might thread the way between the coral patches, if necessary.

Lights.—Two leading lights, on masts, have been established by the French New Hebrides Co. on the eastern side of Fila Harbor.

The front light, fixed red, elevated 132 feet above high water and visible 9 miles, is situated at a distance of about 600 yards south-westward from the conspicuous tree on the summit of the hill 386 feet high.

The rear light, fixed red, elevated 295 feet above high water and visible 9 miles, is situated at a distance of 480 yards 78° from the front light.

The above lights in line 78° lead through the harbor entrance in not less than 12 fathoms.

Should the masts on which the lights are exhibited be not distinguishable from seaward, an excellent mark for entering the harbor is the prominent wooded hill 386 feet in height and with a conspicuous tree on its summit, near the inner light above mentioned, which, kept on a bearing of 77° , leads through in mid-channel.

Anchorage.—The best anchorage for all classes of vessels is on a patch of 10 to 12 fathoms, sand and coral, situated 550 yards 325° of Fila Island, which gives 300 yards swinging room from the reef off Iririki, and the 5-fathom line off Fila Island. This patch is small, but may easily be found by entering the harbor with the cairn on the north extreme of Iririki bearing 92° until the east point of Fila is nearly abeam, and then altering course a little to starboard, so as to bring the cairn on an 87° bearing, and when the summit of Vanua Tap is over the east extreme of Fila Island 219° the vessel will be over the shoalest part of this patch.

Small coasting vessels anchor in the northeast part of the harbor, about 350 yards from the pier, in from 7 to 10 fathoms.

Supplies.—There are several settlers of various nationalities living around Fila Harbor who cultivate coffee, maize, etc., with success, and the French New Hebrides Co. have a store from which they get most of their supplies.

It is difficult to procure beef or mutton, as only a small number of cattle and sheep are kept. Vegetables are also scarce, as only a small quantity are grown for the use of the residents.

Water may be obtained from some springs and a small stream in the inlet at the northern end of the harbor, but it is not easy to ship it into the boats, while there would be considerable difficulty in the laden boats crossing the barrier reef stretching across the northern part of the harbor even at high water.

Coal.—A coal hulk is moored in the harbor at $\frac{1}{4}$ mile southeastward of the mission church.

Coast.—From the 15-foot rock on the northern side of the entrance to Fila Harbor the coast trends northward for 1 mile, and is fronted by a reef which dries in patches at low water. It then turns northwestward for 2 miles as a white sand beach to a small point opposite Meli Island, with several streams running through it from the extensive plain behind.

A rocky patch, part of which dries from 1 to 3 feet at low water, lies in the northeast corner of Meli Bay. The outer end, which is 800 yards from the shore, lies with the south point of Meli Island 305° . There is a passage about 20 yards wide between these rocks and the beach through which boats can pass.

Meli Island, on which stands a village and a few trees, is small and low, situated on a coral reef which is detached from the shore by a channel about 100 yards wide, in which the least depth is 5 fathoms.

There is a boulder which dries 3 feet on the northeastern part of this reef lying 150 yards 100° of Meli Island. It is a good mark when using the channel, but, as the water is discolored and the edges of the reefs difficult to distinguish, it is not advisable to take vessels through this passage.

A coral bank with 4 fathoms over it, and possibly less, lies 1,200 yards 201° of Meli Island. It does not show up well, and therefore should be given a good berth.

Anchorage may be obtained northward of Meli Island in from 15 to 20 fathoms.

Water.—Good water can be obtained from a stream situated $1\frac{1}{2}$ miles southeastward of this island.

Devil Point is a low wooded promontory lying 5 miles westward from Pango Point, and forms the southeast extreme of the peninsula which separates Meli Bay from the entrance to Havannah Harbor. It has some rocky ledges extending a short distance seaward.

Tide rips.—Strong tide ripples and overfalls are frequent off this point even in calm weather, extending in a narrow belt for several miles southward, and it is probable that from the disturbed and broken state of the water off this point, causing great difficulty for canoes and small boats to round it, that its name has been derived.

Coast.—At 1 mile northwestward from Devil Point is another low point, which is steep-to, and between them is a small bight receding $\frac{1}{2}$ mile, which has a reef extending nearly across its head, with deep water inside. Boats are able to get behind this reef through a channel in the northwest corner of the bight and can thus effect a landing in any weather.

At $1\frac{1}{2}$ miles northwestward from this second point is Tuki Tuki Point, a low tongue of land covered with trees to the water line. Between these low points is a bay $1\frac{1}{2}$ miles in extent but unfit for anchorage.

On the north side of Tuki Tuki Point, and $\frac{1}{4}$ mile from its extremity, are some white houses (belonging to a French settler) which show well from the northward.

Anchorage may be obtained off these houses in 12 fathoms, sand and shells, with extreme of Tuki Tuki Point 201° and Cliffy Point 63° , distant $\frac{1}{2}$ mile.

From Tuki Tuki Point the coast trends $4\frac{1}{2}$ miles northward to Baffling Point. It is steep-to and backed by a perpendicular cliff which attains a height of 605 feet at $2\frac{1}{2}$ miles from Tuki Tuki Point, and then gradually slopes to 375 feet above Baffling Point. At 1,200 yards to the southward of Baffling Point there is a bare patch in the cliff which shows conspicuously from seaward and appears as a waterfall.

Paul Rock is a coral patch about 50 yards in diameter, with 4 feet at low-water springs, and steep-to on all sides, lying 800 yards from the shore, with Baffling Point in line with the summit of Leleppa Island 28° , distant 1,400 yards.

Erradaka (Hat Island), which lies nearly 2 miles westward of Baffling Point, is a prominent object when approaching Havannah Harbor. It resembles a low-crowned hat from all points of view, being formed of a coral mound with precipitous sides standing in the middle of a low island. It is thickly covered with trees and rises to a height of 345 feet.

The island is 2,400 yards in length northeast and southwest and 700 yards wide, with coral reefs extending 400 yards from its north and west points, but is steep-to on its south and east sides.

Havannah Harbor may be described as the basin of deep water inclosed between the northwest coast of Efate Island and the off-lying islands Leleppa and Moso or Veras. It is about 6 miles long

in a 43° and opposite direction, with an average width of about 1½ miles, but owing to the great depth of water there are but few spots where anchorage can be obtained. It is available for all classes of vessels.

There are two ship channels into this harbor, one between Efate and Leleppa Island named Hilliard Channel, which is the wider and deeper of the two; the other between Leleppa and Moso Islands, named Little Entrance. There is also a passage for boats at the north-east end of the harbor leading to seaward over the reefs between Efate and Moso Islands.

Leleppa or Protection Island, forming the western side of Havannah Harbor, is an irregular-shaped island 2° miles long north and south, with a greatest breadth of 1½ miles. The highest part of the island is covered with coarse grass, but there are trees on the slopes and in the gullies. Its summit, which is near the southern end, is 637 feet in height.

The western and greater portion of the southern sides are formed of steep coral cliffs from 100 to 200 feet high, and off the west point there is a small islet 40 feet in height, with a reef extending about 200 yards to seaward.

The island is surrounded by a narrow fringing reef, which is seldom more than 100 yards wide and is steep-to.

The northwest part of this island is marked by two high bold points, and the reef extends 300 yards northwestward of them. Tuki Tuki Point (the southwest extreme of Efate), in line with the islet off the west point of Leleppa, leads westward of all dangers off this point.

Temporary anchorage may be obtained off the west side of Leleppa, as the water shoals gradually, and the 20-fathom line is 600 yards from the shore.

There are several villages on this island, the largest is near the southeast corner and gives its name to the island.

Hilliard Channel, 1,400 yards across in its narrowest part, is very deep and clear of dangers, with the exception of the fringing reef, which on the Efate side extends nearly 400 yards.

Little entrance between Leleppa and Moso Islands is a good channel for entering Havannah Harbor from the northward, and having not less than 6 fathoms can be used by large vessels.

The entrance is 550 yards wide, but as shoal water extends off the points on either side the channel is reduced to 250 yards in the narrowest part between the 5-fathom lines.

Eastern shore.—From Baffling Point the eastern shore trends northeastward for 3½ miles to the entrance of Ai Valley (a deep gorge running back into the high table-land which lies behind this coast);

it then turns northward for 2 miles to White Sand Point, which is a low sandy spit with deep water close-to.

Between 500 yards and a mile southward of White Sand Point a sunken coral reef extends in three prongs for 300 yards from the shores the outer ends of which are steep-to; but owing to the discolored condition of the water inside the harbor this reef is not easily distinguished.

Mission.—There is a Presbyterian mission station, named Samoar, on White Sand Point, but the houses are hidden among the trees and do not show until the point is nearly abeam. There is a small flag-staff near the shore close to the boathouse.

Hannant Rock.—From White Sand Point the coast trends north-eastward for $\frac{3}{4}$ mile to a slight projection named Ree Point, off which a coral spit projects 200 yards. Hannant Rock, which is 50 or 60 yards from the extremity, dries 2 feet at low water springs; its outer edge is steep-to.

Trading station—Anchorage.—From thence the shore trends eastward for 1,600 yards when it turns to the northward for another 1,600 yards to Dark Sand Point, forming Matapu Bay, in which vessels usually anchor.

At the inner part of this bay are the houses belonging to the French New Hebrides Co., and two small piers at which landing can be effected at all times of tide. The French New Hebrides Co. own most of the land near the anchorage, and have several good houses for their agents, as well as a store from which they supply the settlers in the vicinity, and also any vessels that may require small quantities of tinned provisions, while it is also used as a trading station with the natives.

Essema Bay.—Between Dark Sand Point and Bluff Point, at the entrance to the boat channel, is Essema Bay, 1,400 yards wide, and recedes $\frac{1}{2}$ mile, where there is a very good anchorage in 7 to 13 fathoms; but it is rarely used, as the settlement has been established in the bay to the southward. There are mangrove swamps, and several small streams run into this bay which would probably render it unhealthful.

In the northeast part of Havannah Harbor is a small patch of coral with $4\frac{1}{2}$ fathoms over it at low-water springs. It lies with Bluff Point 41° , distant 900 yards.

Communication.—The small British steamer belonging to the Australian Union Steam Navigation Co. calls here every fortnight on the way north or south through the group; and a French steamer from Noumea is supposed to call once a month, but no reliance can be placed on her movements.

Directions.—When entering by Hilliard Channel, after rounding the east point of Ieleppa Island at a distance of 400 yards, a course

about north should be steered until Dark Sand Point begins to open of White Sand Point, when a 52° course may be steered for Bluff Point, passing 300 yards from White Sand Point. When Reef Point is abeam, steer for the French store and anchor as convenient.

When entering by Little Entrance, bring the middle of the passage between the islands to bear 130° , and steer through in mid-channel until the whitewashed rock (12 feet high) off Moso Island, opposite White Sand Point, bears 38° , then steer 72° until Reef Point is abeam, then alter course 94° for the French store and take up anchorage where convenient.

Anchorage.—The best anchorage is in 16 fathoms, sand, with White Sand and Reef Points in line 252° and the stone pier in front of French store 108° , distant 300 yards.

Observation spot, on the sandy point 900 yards north of the stone pier is in latitude $17^{\circ} 33' 17''$ S., longitude $168^{\circ} 16' 46''$ E.

Tides.—It is high water, full and change, at Havannah Harbor at 6h. 29m.; springs rise 4 feet, neaps rise 3 feet 2 inches, and range 2 feet 4 inches.

Supplies.—Beef can generally be obtained if sufficient quantity is required to make it worth while to kill a bullock. Mutton can usually be obtained, as well as pigs and poultry. Sometimes a small quantity of vegetables may be procured, and flour can generally be purchased at the store.

Water.—There are several good streams running into Havannah Harbor, but the best water is to be obtained at the stream $\frac{1}{2}$ mile to the westward of the stone pier. Boats can be beached close to its mouth, when a starting hose and length of canvas hose is all that is required to fill the boat.

Boat passage.—Between Efate and Moso Island there is a passage $2\frac{1}{2}$ miles long and 600 yards broad, which, though deep at its western end, shoals to the eastward, where there is only sufficient depth for boats to pass, even at high water. This passage opens out on the reefs connecting the two islands, and at low-water springs is almost dry.

Moso or Verao Island, formerly known as Deception Island, is 6 miles in length northeast and southwest and about $1\frac{1}{2}$ miles wide, forming the northwest side of Havannah Harbor. It is comparatively low, consisting of several grass-covered hills, the highest of which is 423 feet, with here and there a few clumps of trees, except on the harbor side, where there is a belt of trees and coconut palms.

There are several villages in different parts, each giving its own name to the island; but Moso is that by which it is best known by both Europeans and natives, while "Verao" simply means "long."

The principal village, named Siwo, is situated near a point on the southeast side, where the schoolhouse or chapel is a conspicuous white building.

Off the southwest point a reef extends nearly 200 yards seaward across the mouth of Little Entrance. At $1\frac{1}{2}$ miles northward of this point a sunken coral reef, which does not always break, extends 800 yards from the shore.

Another coral reef nearly awash at low water extends 700 yards from the northwest point. Its position is nearly always indicated by breakers.

Undine Bay is formed by the islands Nguna, Pele, and Kakula with the north coast of Efate and Moso Islands. It is about 7 miles long and $3\frac{1}{2}$ miles wide, and is of no importance.

From the north entrance to Boat Passage the coast of Efate trends eastward for 1 mile to Siviri Point, where there is a large village of the same name. It then turns southeastward for $1\frac{3}{4}$ miles to the inner part of Palao Bay, where a considerable stream, which drains the large valley at the foot of the high mountains, flows into the sea. Boats can enter the mouth of this stream at all times, except at low-water springs, and obtain good landing at a boathouse just inside the entrance.

There is a patch of coral named Malu Reef lying in Palao Bay, with Siviri Point 303° , and the east end of long sand beach 184° . It dries at low water.

The anchorage in Palao Bay is not recommended, as the bottom is sand with coral knolls, which the chain would be liable to foul while swinging at anchor. The whole of the northern coast is fronted by a broken fringing reef of coral, and should not be approached within $\frac{1}{2}$ mile.

Overlooking this coast there are some high peaks, whose slopes descend steeply to the shore, and most of them are covered with trees. A sharp bare peak, 1,471 feet high, named Fatmalapa, is a conspicuous and excellent mark.

Nguna or Montague Island is a high volcanic island, 5 miles in length northwest and southeast and $1\frac{3}{4}$ miles wide. Its sides are very steep and the southwest part is thickly covered with trees. There is but little coral around its shores. Tavanaki, the principal peak, 2,013 feet in height, is situated near the middle of the island, its bold crater-like appearance making it a good mark when approaching Efate.

Na ora matua.—On the northwest side of Nguna two low rocky points, 1,200 yards apart, project from the spurs of the neighboring hills, and the water between them being of moderate depth forms the anchorage Na ora matua, which is a very convenient one during the prevalence of the trade wind.

The best anchorage is in 11 fathoms, with the north point of the bay in line with the south peak of Mataso 35° and the hut on the beach 125° . The holding ground is not good, so that it is not a desirable anchorage with onshore winds.

There is a village behind the beach with a native teacher and school-house and the natives are friendly.

A coral reef fringes the shore of this small bay, which makes landing awkward except near high water, when boats can cross the reef and land on the beach.

Taoloa village is near the southeast point of Nguna. There is a station here of the Presbyterian mission and handsome church, with resident missionary, but nearly all the buildings are hidden among the trees and are not visible from seaward.

An anchorage may be picked up opposite a small stream near the mission station, in $7\frac{1}{2}$ fathoms, sand and coral, about 400 yards from the beach, with south extreme of Nguna Island 288° , east extreme of Nguna Island 63° . The bottom is irregular here in deeper water than that given.

Pele Island is also volcanic, and covered in most parts with coarse grass. Its summit is 662 feet high. It is nearly 2 miles long and 1 mile in width, filling up the greater part of the space between the southeast point of Nguna and Efate.

Foul ground extends for some distance off its western side which should not be approached to within $\frac{3}{4}$ mile.

There is a narrow channel for boats between Nguna and Pele which can be used at all times of tide with care to avoid the coral heads which stud the channel.

Kakula is a small low island covered with trees, situated on the coral reef which projects 1 mile from the north shore of Efate. A village is hidden among the trees of this island, and the inhabitants cross over to Efate every day to work on their cultivated ground.

Ship channel.—Between the reefs extending from the south side of Pele and the north side of Kakula there is an excellent ship channel 400 yards wide in its narrowest part and having nothing less than 8 fathoms throughout. A course 268° leads through the middle of this channel, but as the tidal streams run strongly and there is no mark to steer for, it is advisable to go through only with a favorable light and then steer by eye, as the reefs on either hand can then be clearly seen.

Rinali Reef is a small isolated patch lying more than 200 yards from the edge of the extensive shore reef, $1\frac{1}{2}$ miles 83° from the north end of Kakula Island. As the sea always breaks on it, there is no difficulty in avoiding it.

Several small rocks and islets, on some of which are a few bushes, lie scattered on the broad expanse of reef off Efate, most of them near the northern edge.

Mangea Reefs consist of two patches of coral lying about $\frac{1}{2}$ mile from the shore, having a deep but narrow channel between them and the shore reef. There is a sand cay on the southern reef which is 4 feet high, and lying with Quoin Hill 246° . As the sea always breaks heavily on these reefs, there is no difficulty in making them out.

Mau or Hinchinbrook Island is a volcanic island, almost circular, nearly 2 miles in diameter, with its sides rising up steeply from the beach, and having a large crater in the middle which is thickly covered with vegetation. The summit of the northern lip of the crater is 1,493 feet in height, and that on the southern side 1,367 feet.

There are several villages on the south side of the island, and the natives are all peaceably disposed.

Anchorage.—Fairly good anchorage may be obtained off the west side of Mau, with protection from winds between northeast and south, but much exposed to the northward. The best position is in 11 fathoms, coral bottom, with the south hill of Mau in line with the hut on the beach 88° ; right extreme of Mau, 147° .

The tidal stream sets strongly and very erratically around this island, so that a vessel is frequently kept broadside on to the swell, which may set around the island, causing her to surge about, dragging the bight of the chain over the coral.

Should the wind be far to the northward, another anchorage may be picked up on the southwest side in 9 fathoms, with the right extreme of Mau 97° ; south hill of Mau, 47° .

The north side of Mau is steep-to, but on the east and west sides are narrow fringing reefs; while to the southward the reef extends for more than 600 yards from the shore.

There is a small rocky islet about 40 feet high close to the northeast side of Mau.

There is a curious lagoon on the west side of Mau; the only entrance into it is through a narrow channel which is more or less blocked with large stones by the natives to prevent the stock of fish which they keep inside from getting out.

Water.—Fresh water in small quantities may be obtained from holes in the sand spit between the lagoon and the sea.

Landing.—The best landing is on the west side of the island opposite the hut, where some loose stones have been piled up by the natives to form a passage; but near high water is always the best time for landing, as the reef is much broken up into bowlders on which a boat might sustain damage when entering with any swell.

Scott Rocks.—The soundings on the east side of Mau are somewhat irregular, varying in depth considerably, and at 3 miles from the island there are two pinnacle rocks, about 50 yards apart, with 15 fathoms between them. The eastern rock has a least depth of 22 feet, and the western rock has 24 feet over it at low-water springs. They are situated with the north point of Mau bearing 280° and the south point 255° .

These rocks are very steep-to around, so that the lead gives no warning of approaching danger, while from their small size they do not break even with a heavy sea running.

The current in the vicinity often runs strongly to the westward but is irregular.

Efate east coast.—There are several villages along the east coast of Efate, the principal of which are Ebuli and Bong, situated at the mouths of small streams; both have mission teachers and schools established at them.

At Ebuli, which bears $1\frac{1}{2}$ miles 122° from Quoin Hill, a boat may in almost any weather enter through a gap in the reef about 30 or 40 yards wide, and when inside there is a small cove at the entrance of the stream with a depth of from 10 to 2 fathoms, shoaling gradually over a sandy bottom.

Metensa Bay, near the east point of Efate, is 1,100 yards wide and recedes 1,000 yards. It is a very good anchorage for small craft except with winds between north and east. The reefs extend from the shore on either side, leaving a space 400 yards wide, in which there is a depth of from 5 to 8 fathoms with a sandy bottom.

Caution is necessary on entering to avoid a rock with $1\frac{1}{2}$ fathoms over it at low water, lying 400 yards 108° from the wooded point in the northwest part of the bay. The reef on the south side being steep-to may be kept close aboard until well inside, and anchorage picked up as convenient.

If desirable, anchorage may be obtained outside the bay in 15 fathoms sand and coral, with Quoin Hill in line with the north point of the bay 319° , and the left extreme of the point in the bay 260° .

A Frenchman has settled at Urru Village, at the head of Metensa Bay, and cultivates the land in the vicinity, which is well watered by a small stream which flows into the northwest part of the bay.

Coast.—From Metensa Bay the coast trends east for $2\frac{1}{2}$ miles to Manuro Point, the eastern extreme of Efate, which is a low rounded point covered thickly with trees, and having a fringing reef extending about 400 yards seaward. Outside the reef the water is deep and clear of dangers. Tide ripples extend sometimes for a long distance off this point, and give the appearance of shoal water.

A shoal on which a depth of 5 fathoms was obtained, and every indication of less water seen, lies approximately in latitude $17^{\circ} 44' S.$, longitude $168^{\circ} 35' E.$

Mataso (Two Hills) Island, so named from consisting of two elevations connected by a low strip of land, lies $10\frac{1}{2}$ miles 43° from the north end of Nguna Island, and is $1\frac{1}{2}$ miles long northwest and southeast.

The summit is a very conspicuous object, being a sharp peak 1,643 feet in height, while the southern hill is only 465 feet high. From a distance it appears as two islands (hence its name), as the low connecting land does not appear until within a few miles.

Mataso is steep-to on all sides. In the bights on either side of the lowland there are narrow fringing reefs which are nearly dry at low water, and there is also a strip of fringing reef on the southwest side of the summit extending nearly 200 yards from the shore.

A rock 5 feet high lies 200 yards from the north extreme of the island, with a passage for boats between it and the shore. Another rock, 4 feet high, lies 200 yards to the eastward of the south point of the island.

Anchorage.—Temporary anchorage might be obtained in 14 fathoms, sand and coral, in the bight of the south side of the island about 400 yards from the shore; but it is not a desirable place, as the swell always sets round the south point of the island, even with the wind to the northward of east.

Landing.—There is a narrow gully in the fringing reef on the southern side of Mataso, through which a landing can be effected in ordinary weather, or when the swell is not heavy. The natives will generally point out its position when they see a boat approaching; but great caution is necessary, as the gully is only about 20 feet wide. Generally it is better to land on the west side of the island and walk round the southwest point to the village.

Natives.—The inhabitants, numbering about 100 or less, are very friendly. They all profess Christianity, and have a native teacher and schoolhouse. Their village is on the lowland between the hills surrounded with coconut palms.

A few supplies in the way of goats, fowls, and eggs may be obtained, but yams are only grown in sufficient quantity for the use of the inhabitants.

Monument (Wot) Rock, which is an inaccessible islet 397 feet in height and 130 yards in diameter, $1\frac{1}{2}$ miles 26° from the south point of Mataso. It is a great resort for sea birds, and, having little or no vegetation, its steep sides whitened by guano often gives it the appearance of a sail in the distance, particularly on moonlight nights.

It is very steep-to on its eastern side, but the depths are more gradual toward Mataso, dropping off into 50 fathoms in mid-channel.

Currents.—The currents and tidal streams often run strongly in the vicinity of Mataso and Monument Rock, causing at times considerable tide ripples, especially to the northward of Mataso and over the shoaler water on the northwest side of Monument Rock. As far as could be ascertained, the ebb sets to the eastward off the south coast of Mataso, and then curves to the northward between the islands; but doubtless the influence of the wind has the greatest effect, especially if the trade be blowing strong.

Makura Island, lying 6 miles northward of Mataso, is quoin shaped, 979 feet high, rather more than 1 mile in length northwest and southeast and 1,200 yards wide. The eastern end is bold and steep, sloping off more gradually to the western part, where there is a white sandy beach fronted by a narrow fringing reef.

Anchorage.—This island is steep-to around, but anchorage may be obtained in 11 fathoms, sand and coral, off the western end, 400 yards from the shore, with the extremes of Makura 63° and 137° .

At this anchorage the ebb stream runs to the northward as much as $1\frac{1}{2}$ knots an hour during spring tides; but the flood stream has no particular direction, as the ship appears to be in a backwater under the lee of the island. During the flood there are marked tide ripples off the west end of the island, giving an appearance of shoal water.

Landing is at all times difficult with ships' boats, as the swell sets round both sides of the island; but by watching for an opportunity the boat may be taken over the fringing reef and hauled up on the beach, otherwise it is advisable to get the natives to bring off a canoe.

Natives.—There is a very neat and clean village on the lowland near the western part of the island. They all profess Christianity, and are ready to sell such small supplies as they can spare.

Mai (Three Hills) Island is $5\frac{1}{2}$ miles in length northeast and southwest by about $1\frac{1}{2}$ miles wide; deriving its name from having three conspicuous hills, which, at a distance, appear as separate islands. The northeastern hill, named Maunga, is the highest, being 2,171 feet above the sea, and presents a smooth regular outline, its dome-shaped summit sloping evenly down in all directions. The middle hill is another even-shaped cone, 1,504 feet high; while the southwestern hill is 1,803 feet in height, with an elbow or spur on its southern side. This island is thickly wooded. Its western point is formed by low flat land, extending $\frac{3}{4}$ mile from the base of the hills.

Off the southwest point of Mai the reef is nearly $\frac{1}{2}$ mile wide, with several conspicuous black rocks, which are always uncovered. On the eastern side the fringing reef, which is only about 150 yards wide opposite the southern summit, gradually widens, till in the middle of the bight on that side it extends nearly 400 yards from the shore.

In this bight, opposite the village of Venonga, there is a break in the reef where boats can generally obtain a landing. From thence the reef again increases its distance from the shore, until off the east point it is $\frac{1}{2}$ mile wide, but soon closes the land again, and along the north coast extends less than 200 yards from the beach.

On the western or lee side the reef is much broken up, extending in some places to $\frac{1}{2}$ mile from the shore; and, as it is difficult to distinguish on account of the smooth and discolored state of the water, this side of the island should not be approached to within $\frac{1}{2}$ mile.

Sasaki anchorage.—Near Sasaki Point, on the west side of Mai, there is a snug and quiet anchorage when the wind is from between north-northeast and southwest, the best position being in 10 fathoms, sand and coral, with Maunga summit 92° , the summit of Makura seen over the low dip in Mai Island, in line with a cluster of rocks on the beach, 142° .

Large vessels will do better to anchor about 100 yards farther out, in 12 fathoms.

Sasaki Point is in latitude $17^{\circ} 2' 50''$ S., longitude $168^{\circ} 22' 45''$ E.

Landmark.—A white building in front of the trader's house is a conspicuous object.

Tides.—It is high water, full and change, at Mai Island about 6h. 30m., with a spring rise of 5 feet. At the anchorage the tidal streams run at the rate of $1\frac{1}{2}$ knots an hour, the flood setting to the eastward and the ebb in the opposite direction.

Landing.—The best landing place is opposite a cluster of huts on the beach, bearing 178° from the anchorage, where a break in the reef enables boats to reach the beach at almost any state of tide.

Natives.—The population of Mai is distributed in seven villages, five of which are close to the beach on the east coast, while another is situated on the low land near the west point, and Sasaki lies at the foot of the western slopes of Maunga. Two dialects are spoken, one on the east and the other on the west side of Mai. The natives all profess Christianity, they have a peaceful, inoffensive manner, do not carry any weapons, and it is difficult to find any on the island now.

Produce.—A considerable quantity of copra is made on Mai. The local steamer belonging to the Australian Union Steam Navigation Co. calls occasionally to purchase the copra, money and calico being generally given in exchange.

Supplies.—Pigs, fowls, yams, sweet potatoes, cabbage, lemons, and oranges can be obtained by visiting the villages and bartering with the natives, money, tobacco, or calico being required in exchange. Sasaki and Makata are the two best villages for that purpose.

Cook Reef or Pula-iwa is a dangerous coral reef of atoll formation, lying $2\frac{1}{2}$ miles westward of Mai Island. It is 2 miles long east and west by about $1\frac{1}{2}$ miles wide. The outer edge of this reef dries

in many parts at low-water springs, while inside there is a general depth of from 6 to 8 feet, with a white sandy bottom, over which are scattered numerous coral heads, which are nearly awash at low water.

This reef is steep-to except on its southern side, where a spit 10 fathoms below the surface projects for nearly $\frac{1}{2}$ mile. The sea breaks heavily on the weather side, but the lee side is not well marked unless the light be good, when the discolored water is easily discernible.

Shepherd Islands are a volcanic group extending in a southeasterly direction from the east extreme of Epi Island. This group consists of seven islands, besides several small rocks or islets. They are of comparatively recent formation, as no coral was found growing round the coast or on the adjacent shores of Epi, and on a few occasions only was coral brought up on the lead, while native tradition states that a great eruption and earthquake took place about 250 or 300 years ago, when these islands, which then formed part of Epi, were broken up into their present form. At any rate, they all lie inside the 100-fathom line, and their relative positions and appearance add weight to the report. Tongoa Island, which is the largest, is a collection of volcanic mounds and cone-shaped hills, now thickly covered with trees and tropical vegetation, and at the tops of these hills pumice stone and scoria is thickly mixed with the rich volcanic soil.

Current.—The current among the Shepherd Islands is much affected by the winds, the general tendency of the ocean surface being toward the northwest when the trade wind is blowing, but its rate and direction are again altered by the tidal streams.

Tidal streams.—As a rule the flood stream sets to the westward and the ebb to the eastward through the channels between the islands, and as some of them are very narrow, a considerable velocity is attained; for instance, the flood tide has been observed on more than one occasion to be running to the westward nearly 3 knots an hour between Valea and Ewose, while reports say that at times this is much exceeded.

As might be expected, these swift running streams through narrow channels cause strong tide ripples and eddies, which may usually be found on the side of exit through the passages, and often of a character which is dangerous to open boats. These ripples cause an appearance of shoal water and doubtless led to the supposition that many dangers existed among this group.

Tongariki, which is the southeastern and second largest island in the group, is rather more than 2 miles long east and west, with an average width of $\frac{1}{4}$ mile. Near its eastern end is the cone-shaped summit, 1,687 feet in height.

Tongariki is thickly covered with vegetation to the summit; its shores are formed of boulders and volcanic rocks, with a few black sand beaches. It is steep-to around.

A mission station is established on this island, and being built on the ridge near the middle of the island, the white house shows conspicuously from the northward.

Anchorage during the prevailing wind may be obtained off the northwest side of the island in $12\frac{1}{2}$ fathoms, black sand, about 350 yards from the beach, with the extremes of Tongariki, 52° and 201° , but the swell generally sets round the island, and as the tides run strongly past the anchorage, a vessel would roll considerably.

The landing place is opposite the lower part of a gully running down from the mission house to a sand and cobble beach; but as this beach is very steep, caution is necessary, as even in calm weather there is a considerable amount of scend.

Amora Rocks, lying 700 yards from the south point of Tongariki, are bare, jagged, and 112 feet high. The outermost rocks are two small heads only about 5 feet high, lying 1,200 yards, 139° from the south end of Tongariki. They are steep-to around, and there is a channel between them and Tongariki, but as the tidal streams run strong with eddies it is not desirable to make use of it.

Buninga, the southwestern of the Shepherd Group, is $\frac{3}{4}$ mile long northeast and southwest and 1,200 yards wide. It has a somewhat flat and even summit 723 feet in height, with steep bold sides; it is thickly covered with vegetation, and the inhabitants, numbering about 100, all profess Christianity and live in a village near the summit.

Landing may be effected on a stony beach under the lee of an out-lying rock near the northeast point; but, as usual, care is required to prevent the boat being bilged on the bowlders.

Michelsen Rock lies 500 yards 103° from the northeast point of Buninga; the least depth over it is 6 feet at low water. It does not always show, therefore should be given a wide berth.

Valea is a narrow, almost inaccessible island lying 1 mile northwest of Tongariki. It is 1,300 yards long north and south and nearly 400 yards wide. Its sides are precipitous cliffs, and above them is thick vegetation and coconut groves. There are two hills, the northern 352 and the southern 367 feet in height.

This island is uninhabited, but the natives of Tongariki visit it occasionally to collect the coconuts, effecting a precarious landing in a cleft in the rocks on the northwest side.

Ewose is another narrow island lying $1\frac{1}{2}$ miles northwest of Valea. It is $1\frac{1}{2}$ miles long northwest and southeast by 600 yards wide and is formed by a steep narrow ridge rising to a height of 1,076 feet, with almost precipitous sides, except to the northward, where it slopes down to a stony beach on which there is a small village.

On the east side of Ewose the shoal extends about 200 yards to seaward, on which the sea often breaks, and the 10-fathom line extends

600 yards from the shore. A small rock, which is a wash at high water, lies midway along the western side at 100 yards from the beach. A stony spit, which uncovers in parts at low water, projects 200 yards from the northwest point toward the southwest point of Tongoa.

Anchorage may be obtained under the lee of Ewose near the northwest point in 11 fathoms, black sand, with the extremes of Ewose 24° and 142° , the latter in a line with a southern summit of Valea. The water is generally smooth there, but if the trade wind be strong, the squalls would come round both ends of the island very sharply and cause a vessel to ride uneasily.

In the channel between Valea and Ewose the tides at times run strongly, causing eddies and ripples which look very alarming. The flood stream sets to the westward and the ebb to the eastward; the former on several occasions was found to run between 2 and 3 knots an hour.

Tongoa, the largest and most important of the Shepherd Group, is 5 miles in length northeast and southwest and an average width of nearly 3 miles. This island is populous and fertile, covered with vegetation to the summits of all the hills, and with plenty of land under cultivation, making copra being the chief employment of the natives.

From a distance Tongoa Island presents the appearance of a cluster of hills, most of which are cone shaped, with the exception of two or three which are table topped. Tava ni Orata, the highest, is in the northeastern part of the island, and 1,674 feet in height.

A Presbyterian missionary is stationed on Tongoa, and has his headquarters near Lumbukuti village. The natives nearly all profess Christianity, having native teachers and schools in all their villages.

Tuft Rock, which is a small islet or rock having a conspicuous tree growing on its summit, is 66 feet in height; it lies off the southwest point of Tongoa, from which it is separated by a narrow boat channel.

East coast.—From thence the coast trends to the east and northeast for 3 miles to a projecting point, off which is a low, flat rock extending 300 yards from the shore. This coast is a succession of steep bluff points and small sand beaches.

The coast then trends nearly 2 miles northeastward (past two small bays) to a bold point over which is a conspicuous hill 1,333 feet in height, named Tava ni Akoma.

A small islet, 20 feet in height, lies 1,200 yards in front of this coast; it is steep to around, and may be passed on either side.

From the point under Tava ni Akoma the coast becomes low and formed of broken ledges and volcanic boulders, trending to the northwestward, and then westward to Boiling Point, which is the northern extreme of Tongoa, and it should be given a good berth.

A ledge of rocks, covered at low water, extends 150 yards from Boiling Point, but outside those rocks the water deepens quickly to 100 fathoms.

Selembanga mission.—Half a mile northwest from Tava ni Akoma stands Selembanga Church. It is a large white building on a ridge about 350 feet above the sea, which shows conspicuously from the eastward. Selembanga is the second village in importance on the island.

North coast—Boiling Point.—A short distance to the eastward of Boiling Point is a bare patch of land, 20 to 25 acres in extent, fronted by a cliff 50 feet high. The ground is quite hot and gives off steam in places. The natives sometimes cook their food in holes dug in the ground, which is at too high a temperature to allow the palm of the hand to rest on the surface.

From Boiling Point the coast presents a high line of cliffs for nearly 2 miles to Lubalea Point, and forms a bay which recedes about 670 yards. The water in front of these cliffs is very deep.

West coast.—Off Lubalea Point is a ledge of black rocks, some of which are always uncovered, extending 700 yards 336° from the point. The outer rock is awash at low water and nearly always breaks, but 50 yards farther in is one 15 feet high. That ledge is steep-to on its east and north sides, but the water deepens more gradually to the westward.

From Lubalea Point the coast trends in almost a straight line $3\frac{1}{2}$ miles south to the southwest point. At Aiwa village, in the middle of that coast, there is a black sand beach and a conspicuous white boathouse a short distance to the southward of the mission house bluff.

Anchorage.—The best anchorage off Tongoa is on the west coast, 400 yards 280° of the white boathouse at Aiwa (above mentioned) in 10 fathoms, black sand, with the left extreme of Tevala in a line with mission bluff point north. Tuft rock in a line with the near point 173° . Anchorage may also be obtained in 11 fathoms about 1 mile farther northward on the other side of the bluff.

The best place for landing is in front of the boathouse, on a black, sandy beach, from whence there is a good zigzag path up the hill to the mission house and village of Lumbukuti.

Supplies.—Pigs, fowls, yams, and bananas can be obtained in fair quantities, but no water, there being but few springs or wells. The natives generally using coconuts for drinking purposes.

Sail Rock is a remarkable pillar-shaped inaccessible rock situated midway between Lubalea Point and Cape Cone, Epi Island. There are a few trees on its summit which make it 100 feet in height, and at a distance appears like a vessel under sail. It is steep-to on its

north and west sides, but a bank covered by 6 to 10 fathoms extends 700 yards to the southeastward. A small ledge of rocks covered at low water lies 150 yards southward of Sail Rock, with a single head 6 feet above high water.

Somerville Bank lies between Laika and Tongoa. It is 1,400 yards long northwest by west and southeast by east and 600 yards wide, with depths of from 2 to 5 fathoms over it. Near the center of the southern side stands Mid Rock, 1,600 yards south of Laika Island and 10 feet high, thus forming a good mark for the bank.

There is a deep channel between Laika Island and Somerville Bank, but it is not recommended to be used, as the tidal streams run strongly and irregularly. The channel between Tongoa Island and Somerville Bank is nearly 1 mile wide. This passage is a good and safe one, and the north end of Namuka Island in line with the south extreme of Cape Cone 277° leads through about mid-channel in not less than 25 fathoms.

Tides.—The tidal streams run strong at times, the flood to the westward and the ebb in the opposite direction.

Laika Island stands nearly 2 miles northward of Tongoa. It is small and composed of two quoin-shaped hills joined by a piece of lower land. The north, west, and south sides are steep cliffs diminishing in height gradually to the two eastern points, between which there is a small shallow bay. A ridge of serrated rocks, some of which are 40 to 50 feet high, and tufted here and there with trees, extend for 400 yards westward of the north point of the island, forming a natural breakwater for the western side, where landing may be effected on a sandy beach.

Laika is not permanently inhabited, but the natives from the village near Boiling Point frequently visit the island to collect copra, etc.

Laika Bank is a shoal patch lying rather more than 1 mile westward of Laika Island. It is nearly 1,350 yards in diameter. The least water found upon it was $4\frac{1}{2}$ fathoms; but as the bottom is of black volcanic material it does not show well, while the lead gives but little warning. The tidal streams run strongly over and around this bank, so that the ripples and eddies may sometimes indicate its position. Sail Rock, in line with the east point of Mai Island bearing 195° , leads $\frac{1}{2}$ mile westward of the bank and of the spot described below.

Eruption.—A report from the British naval vessel *Tauranga* (1897) states the existence of a volcanic shoal, which had been in a state of eruption, throwing up red-hot stones and smoke, for a period of three weeks previous to June 18, 1897.

This shoal, consisting of sand a few lava stones on top, was awash on June 21, and appeared to be steep-to on its southern and western sides, with shoal water extending for about a mile southeast by east from it. It is situated on the northern part of Laika Bank.

It is reported that in 1901 this bank became gradually shoaler and higher, first appearing as a heap of ashes and finally as an island $\frac{3}{4}$ mile long, narrow and running from east to west; it had a hill on it 50 feet high. Some Tongoans had visited the island and planted coconuts. They reported a lake in the center. As the older inhabitants reported the previous existence of an island there named Koai, that name had been given to it. The island remained some six months then gradually disappeared. The shoal was easily seen in 1905 by the bright-green color of the water over it.

"Reported dangerous" has been written under Laika Bank.

Tevala is a small and almost inaccessible island lying $\frac{3}{4}$ mile 304° of Laika. It is somewhat quoin shaped, attaining the height of 324 feet at its western end. Its sides are steep cliffs, and the summit is covered with trees. A rock nearly 'awash at low water, upon which the sea generally breaks, lies 150 yards off the north side of the island.

It is not advisable to use the passage between Laika and Tevala under ordinary circumstances.

Epi (Tasiko) lies about 12 miles northward of Mai Island. It is about 25 miles long in a northwest and southwest direction, and varies in width from about 1 mile near its southeastern extremity to 8 or 9 miles in the center of the island. It is of mountainous aspect, everywhere densely wooded, and rising in the center of the island to heights of between 2,000 and 3,000 feet. The highest and most conspicuous mountain on the island is situated on the east side, and is known by the name Tavani Kutali by the natives on the south coast and as Ni ka lo by those on the eastern coast. It is a sharp-looking summit 2,770 feet high, but usually covered by clouds.

Lele Kara Vena (Lookout Point), 2,300 feet in height, is a flattish-topped mountain on the northeast side, with numerous spurs and ranges of nearly the same height extending from it; it is also generally in the clouds.

With the exception of the low ranges on the west coast, which are mostly of upraised coral limestone, Epi appears to be almost entirely volcanic.

Population.—The southern and eastern parts of the islands are not very thickly populated, the villages being small and far apart, but on the western side the natives are more numerous and were always found to be most quiet and inoffensive. A great deal has undoubtedly been done of late years by the Presbyterian missions of Burumba toward civilizing the natives, and now little fear is apparently felt of the "bushmen" by the "salt water" men, and native messengers freely pass across the island from one side to the other.

Missions.—There are two main stations of the Presbyterian mission, one at Burumba, just south of the Foreland on the west coast,

with numerous outlying schoolhouses along the coast, and a small mission house Bo tne mbau at the southeast part of the island. The other station, Ni kau ra, is situated on the northeast side of the island.

Supplies.—Very little can be obtained from the natives except a few yams, bananas, and coconuts.

The south and west coasts of Epi are everywhere bordered by a succession of ranges of hills seldom over 1,000 feet high, with no conspicuous coast peaks except Alombe Range, 1,700 feet high, which overlooks the coast between Nelson and Revolieu Bays, ending to the southwest in a sharp conspicuous peak 1,485 feet high, and the Foreland 655 feet high halfway up the coast. The shore line is a succession of white sand beaches and rocky points, bordered by a narrow fringing reef, with here and there black sandy bays where the streams draining the volcanic ranges in the center of the island find an outlet, causing breaks in the reef, with numerous anchorages for vessels or landing places for boats.

Cape Cone is a bold bluff wooded point 644 feet in height, forming the southeast point of Epi Island, and as the land behind is low, from a distance it almost appears as an island.

The channel between Sail Rock and Cape Cone is 2 miles wide and the tide ripples often give an appearance of shoal water.

Tidal streams.—The tidal streams run very strongly around Cape Cone, the ebb stream setting to the eastward along the south coast of Epi and turning to the northward around the cape, causing very confused ripples and eddies, which are often dangerous for boats when the wind is from the eastward. On several occasions the stream was observed to be running as much as $2\frac{1}{2}$ knots an hour near the cape, but farther out from the shore it does not run so swiftly.

Away from the land in the vicinity of the De Chauillac Bank, 13 miles southwestward of Epi, the flood stream was found to set to the northward and the ebb to the southward, but on approaching the shore the ebb turns to the eastward, and dividing somewhere off Vati to Point one stream runs to the eastward along the south coast of Epi and another to the northward around Duana Point and joins the east-going stream through the channel between Pau-Uma and Epi.

Kambioka Bay.—On the west side of Cape Cone there is a small bay with a black sand and stony beach, behind which there is a lagoon of fresh water. It has been reported that large quantities of ducks frequent this lagoon, but during the months of August and November there was not one to be seen. Landing is difficult, and can only be effected on the sand beach when the sea is smooth.

Coast.—From Cape Cone the general trend of the land is westerly for 5 miles to Sakau Point. The first part of it is steep and bold, at the bottom of which are some bowlders which cover at high tide. Coral has commenced to grow on the bowlders, but the fringing reef does not begin until $3\frac{1}{2}$ miles westward from the cape.

Off Sakau Point the fringing reef extends 400 yards to seaward, but it is well marked by breakers.

Sakau is the first village seen near the coast to the south and west of Cape Ririna; it stands $\frac{1}{2}$ mile to the northwest of the point, which is named after it. The natives mostly profess Christianity; they have a schoolhouse and a native teacher.

Sakau Bay.—From Sakau Point the coast trends northwestward for $\frac{3}{4}$ mile to Sakau Bay, which is $\frac{1}{2}$ mile wide and recedes from the coast line 600 yards. At the inner part there is a black sandy beach the front of which is clear of coral.

Taliko Hill is a conspicuous cone, 864 feet in height, situated 800 yards northward of Sakau Bay, and is an excellent mark from the southward.

Anchorage.—The best anchorage off Sakau is in 7 fathoms, black sand, opposite the middle of the bay, with the summit of Namuka Island 215° and Sakau Point in line with the south extremity of Epi 114° . This anchorage is exposed to the trade wind and a considerable swell often sets in; but in ordinary weather the coast of Epi and Tongoa Island afford a certain degree of protection.

Tidal streams.—At the anchorage the flood tide sets northwest by west and the ebb to the southeast by south.

Landing.—The best place for landing is through a break in the reef on the east side of Sakau Bay, where boats can reach the beach at almost any state of the tide and find smooth water under the lee of the reef.

Supplies.—A few supplies may be obtained at Sakau—pigs, fowls, yams, and bananas. The natives in the vicinity are very friendly, and but few of them carry arms.

Coast.—From Sakau Bay the land trends (with a slight concave curve) to the westward for 8 miles to Malingi Point, the coast being formed of long black sand beaches, with occasional rocky points. There is no fringing reef, but off the points there are spits of rock or reef, which should, therefore, be given a good berth.

The only detached known danger is a small patch with 2 fathoms over it lying 800 yards from the shore at $2\frac{1}{2}$ miles 58° from Malingi Point, and when there is much swell the sea always breaks on it.

At 600 yards northeastward from Malingi Point there is a cluster of black rocks a few yards in front of the sand beach, the highest of

which is 12 feet above high water. A spit of coral reef on which the sea generally breaks extends nearly $\frac{1}{2}$ mile 178° from those rocks.

Anchorage.—The water shoals gradually upon the south side of Epi, so that anchorage may be obtained on a black sandy bottom off almost any part of this coast when the weather is fine.

Malingi Point is low and covered with trees and fronted by a fringing reef which extends nearly 300 yards from the shore. Overlooking this coast, at $\frac{3}{4}$ mile from the beach and $4\frac{1}{4}$ miles northeastward of Malingi Point, is a conspicuous triple-topped hill named Sanalokai, 865 feet in height, with trees up to its summit.

Numerous small streams from the high mountains at the back find their way to the beach, but their mouths are all choked with sand, through which the water filtrates into the sea.

Buguta Cove.—Half a mile westward of Malingi Point is a small cove named Buguta, but the reefs extend so far from either side that there is only a narrow passage in the middle which leads up to a good landing place on a white sandy beach. Bumboko village lies at the head of the cove.

Day Patches are a series of three banks lying in a straight line at distances of 2.6, 3.7, and $5\frac{1}{2}$ miles, respectively, and bearing 268° from Namuka summit. The least depth on either of the two eastern banks is 9 fathoms and 8 fathoms on the western bank, which bears 198° distant 1.1 miles from Malingi Point. The bottom is of dark volcanic sand and scorïæ, which makes the banks difficult to be seen, even when right over them. They are all steep-to, the middle patch being only a small head, while the others are narrow ridges extending east and west.

Namuka Island is small but conspicuous, and is situated 2 miles from the south coast of Epi and $6\frac{1}{2}$ miles westward of Cape Cone. It is 621 feet in height and covered with trees. The island is steep-to and bold at its southern end, but sloping more gradually to the northward, where there is a white sand beach on which landing may generally be effected.

A fringing reef extends for about 200 yards from the northern half of the island; outside of that it is steep-to.

Namuka is uninhabited, but occasionally visited by the natives of Epi Island, who collect a few coconuts, the only produce.

Coast.—From Malingi Point the coast trends westward and at $1\frac{1}{2}$ miles distant is the Point Pangeno, from which a coral reef extends for nearly 400 yards and on which the sea always breaks. Just west of this point there is a small cove with good landing for boats, and a small vessel could find temporary anchorage here in about 8 fathoms. On the point on the east side of the cove there is a hot spring.

Mission station.—Half a mile inland, on the summit of a small hill about 360 feet high, is the mission station Bot tne mbau, belonging to the Burumba mission station some miles farther up the coast.

Diamond Bay or Onamavit is a slight indentation in the coast $6\frac{1}{2}$ miles 167° of the Foreland. There is a copra station here. Temporary anchorage can be had in 10 fathoms, sand and coral, but it can not be recommended in a strong trade wind, as the swell finds its way in, and the sharp point of the reef is too close to be pleasant.

Landmarks.—The trader's house is not visible from seaward, but a shed with a long tin roof and a boathouse to the northward are conspicuous objects.

The land around Diamond Bay is highly cultivated.

Directions.—Steer in with the rock 5 feet high midway between the conspicuous shed and boathouse, bearing 57° , and anchor in a depth of 10 to 15 fathoms.

About 1 mile northwest of Diamond Bay is **Vat i to Point** (three stones), off which are three rocks on the reef, from 5 to 8 feet high, easily distinguishable from seaward.

Nelson Bay, situated northward of **Vat i to Point**, is a stretch of 1 mile of black sandy beach between two points of reef, with very good anchorage off it in 7 to 8 fathoms, sand. A small river runs into the middle of the bay, in which a few wild ducks were found. The river bed is nearly dry and the mouth closed by a sand bank except after heavy rains. It can be walked up for a distance of 3 to 4 miles, through a narrow gorge with very fine scenery, to a waterfall 500 to 600 feet high.

The anchorage is in 7 to 8 fathoms, sand, with the northern green bank at the river mouth in line with the low hill of **Alombei Range** bearing 69° and the highest of the three rocks off **Vat i Point** just showing out clear of the south point bearing 160° .

Off the north point of the bay the reef extends about 300 yards, and a sunken patch of reef with from 3 to 6 feet on it lies another 200 yards farther out, and only breaks in heavy weather, so that this point of the bay should be given a good berth.

Revolieu Bay (Monduk) lies about 2 miles southeast of the Foreland. It is a black sandy bay $\frac{1}{2}$ mile long, affording an excellent anchorage.

Mission station.—Midway between **Revolieu Bay** and the Foreland is the Presbyterian mission station **Burumba**. Except at low water, there is a narrow boat passage through the reef just opposite the mission house.

The Foreland (Revio) is a bold promontory of upraised coral limestone, 655 feet high, and is easily recognizable at a considerable distance from the northward or southward. The bare patches on the cliffs can be seen for a long distance from the westward with the afternoon sun.

Under the northern side of the Foreland, opposite a small sandy beach, is very good anchorage sheltered from the southward and eastward. Enter with conspicuous single coconut tree on the mountain (1,025 feet high) in line with the south fall of the cliffs on the north side of the gorge at the head of the bay, bearing 112° , and anchor directly upon reaching 12 fathoms. The water shoals rapidly and the bottom is foul toward the beach.

Off the corner of the reef on the north side of the Foreland anchorage are several detached coral heads, the outer one being 200 yards from the edge of the reef and named Miranda Rock. It is a small mushroom-shaped coral head having 2 fathoms on it and 8 to 9 fathoms around. It is not easily seen, as the water is often thick from the stream at the head of the bay.

Yemyu Cove, $2\frac{3}{4}$ miles northward of the Foreland, is a fair anchorage off a small sandy bay in 6 to 10 fathoms, easily distinguishable by a rock about 20 feet high at the southern point of the bay. The best anchorage is in 6 fathoms, sand, 600 yards 339° from the rock. When entering care must be taken to avoid a bank with 2 fathoms on it at low water which is situated from 200 to 600 yards 325° of the above rock.

This cove is not recommended, as the swell nearly always finds its way in here, and Ringdove Bay, $1\frac{1}{2}$ miles farther to the northward, affords much better shelter.

Ringdove Bay is a well-protected anchorage from all winds except westerly.

Dick Reef is a coral patch about 200 yards in extent, drying at low water, lying 650 yards 288° from the trader's house.


At the southern corner of the bay, just north of Bain Point, foul ground extends 200 yards from the shore, and midway between it and Dick Reef is a coral head of $3\frac{1}{2}$ fathoms, so that it is not advisable for any but small craft to pass between Dick Reef and the coast.

The anchorage is inshore of Dick Reef between Facio Point and an east and west line drawn 100 yards south of Bain Point, in from 6 to 10 fathoms, sand and coral.

Coffee and maize are grown around the trader's house and a considerable trade is done in copra. The houses and store are situated on the beach midway between Facio and Bain Points and are readily distinguishable from seaward.

Good water can easily be obtained at the southern corner of the bay from a small stream which comes down a valley running back to Lele Kara Vena Hill.

Tides and tidal datum.—It is high water, full and change, at Ringdove Bay at 6h. 10m.; springs rise 5 feet, neaps rise 3 feet 9 inches, neaps range 1 foot 10 inches.

A bench mark  is cut on the foot of the flagstaff opposite the trader's house, 16 feet 9 inches above low-water springs, or 14 feet 8 inches above mean sea level.

Lo mu da Bay.—Two miles farther northward is Lo mu da Bay, with a small copra station in the southeast corner. A reef of sunken rocks extends 500 yards from the shore into the center of the bay. A vessel can anchor at the mouth of the bay, but it is not recommended, as the drop into deep water is sudden.

Duana Point is a well-defined long low sandy point covered with trees, forming the northwest point of Epi Island. The reef extends off it 600 yards northwestward.

La men Island, about $\frac{1}{2}$ mile in extent, is flat and low, except the southern point, which is an upraised mass of coral 195 feet high. It is everywhere densely wooded. It is inhabited by a fine-looking race, quite different to the natives of Epi, but they are said to be rapidly deteriorating from contact with white men. They cross over every day in canoes to the mainland to cultivate their crops. Between La men Island and Duana Point is a channel $\frac{3}{4}$ mile between the reefs.

The tidal streams run strongly through the channel, as much as 3 to 4 knots at springs, the flood to the southward and the ebb to the northward.

Allier Reef lies 2 miles 314° from La men Island. It is composed of sand and coral with a least depth of 2 fathoms, almost circular in shape, and $\frac{1}{4}$ mile wide inside the 5-fathom line. It only breaks in heavy weather, and is not easily distinguishable at other times except with a good light. There is a bank with 20 fathoms least water and $\frac{1}{2}$ mile in extent about $1\frac{1}{4}$ miles northwestward of Allier Reef.

The east coast of Epi, beginning from its south extreme, is a succession of bold rocky bluffs, apparently entirely volcanic in formation, with an almost entire absence of fringing coral reef until the northern end of the island is approached. There are no known offlying dangers on this side of the island.

Cape Ririna, the eastern extreme of Epi, is a bold point 912 feet in height, projecting nearly a mile beyond the line of coast. It has a rock 4 feet high nearly 200 yards southeastward of it.

Three miles northwestward of Cape Ririna is Sugarloaf Point, a bold cliffy bluff with a mountain 1,265 feet high overhanging the point.

Anchorage.—Very fair anchorage may be obtained in the bay westward of Sugarloaf Point, just opposite the western end of a beach of rough boulders about 1 mile beyond the point, in 12 fathoms, black sand, about 600 yards off the beach, with the bluff of Sugarloaf Point 62° . A slight swell sets in around the point.

Little Bluff.—About 5 miles westward of Sugarloaf Point is Little Bluff, 870 feet high, on the east side of which is a pillar-shaped rock 130 feet high, conspicuous from the northward. Between Little Bluff and Sugarloaf Point the island is a little over 1 mile wide, the coast is bold, the sea having apparently encroached up to the coast range, about 800 feet in height.

On the northwest side of Little Bluff is a small bay, at the head of which is a sandy beach with mangroves growing down to the water's edge. There is said to be anchorage here for small vessels, but there can not be much shelter.

The coast is now steep and bold and the shore covered with bowlders for $3\frac{1}{2}$ miles to the Bluff (Nitau), a bold projecting headland 1,920 feet high. A few hundred feet up it, and showing conspicuously from seaward, is a small schoolhouse belonging to the mission station of Ni kau ra farther up the coast. At the back of the Bluff rises the summit Tavani Kutali (Ni ka lo), the highest point of the island, 2,770 feet high.

Drummond Bay, commonly known as Big Bay, is a favorite anchorage for labor vessels. It lies about 2 miles westward of the Bluff and is over 2 miles across.

The 20-fathom line extends about 1 mile from the shore, and a vessel can anchor anywhere with very fair shelter as long as the wind is southward of east by south, but a considerable swell always sets in.

Ariel Point is the easternmost point of the bay. Three hundred yards off it are two small coral patches close together, which always show by breakers. Under the south side of the point is a sandy cove forming a good landing for boats. Sunken rocks and patches of reef extend 400 yards offshore for $\frac{1}{2}$ mile southwestward of the point. Landing can also be effected on a small sandy beach at the southwest corner of the bay under a conspicuous banian tree behind a small projecting point of reef. From here a valley is said to extend across the island to near Malingi Point on the south coast.

Smaile Point, the next point to the northward, has a fringing reef extending off it from 400 to 600 yards. On the reef is a small rock 50 feet high with bushes on it.

Mission.—On an elevation 260 feet high over the point is the Presbyterian mission station Ni kau ra.

North Point is easily recognized by two rocks 5 feet high on the edge of the reef off it. On the west side of North Point there is a small bay (Bai-ia) with an inlet in the reef. There is anchorage for small vessels in fine weather out of the tide in about 8 fathoms with North Point 80°, but care is required in picking it up, and it should only be used with a good light.

Tidal streams.—The tidal streams run very strongly past the northern end of the island, as much as 3 to 4 knots at springs, and

there are nearly always heavy tide rips. The flood sets to the westward and the ebb to the eastward; with the flood there is always a strong eddy inshore. Along the east coast the flood runs northwestward and the ebb southeastward, but never strongly.

De Chauliac Bank, at 13 miles 268° from the Foreland, the west point of Epi Island, is a coral bank $3\frac{1}{4}$ miles long in a northwest and southeast direction, by $1\frac{1}{2}$ miles wide inside the 100-fathom line, with a least depth of 44 fathoms on its eastern side.

Pau Uma Island is 5 miles long in a north-and-south direction and 2 miles wide. It is apparently entirely volcanic and everywhere densely wooded, except where the natives have made clearings for their yam and banana gardens.

It lies westward of Lopevi, from which it is separated by a deep channel 3 miles wide, between the south point of Pau Uma and the north point of Epi is a channel 4 miles in width. The east side of the island is bold and precipitous, surmounted by peaks 1,500 to 1,800 feet high, and the coast covered with boulders. Close off the southeast point is a cluster of rocks the largest of which is a remarkable conical rock 90 feet high, named "The Ninepin."

A fringing reef, 100 to 400 yards wide, extends along almost the whole of the western side of the island.

The boathouse at the mission station is a conspicuous white building.

Mary Stewart Reef, 1 mile northward of the southwest extreme of Pau Uma Island, is a detached patch of coral $\frac{1}{2}$ mile long, with its outer edge at a distance of $\frac{1}{2}$ mile from the shore. It only breaks in heavy weather.

Three-quarters of a mile farther to the northward is a small detached patch at $\frac{1}{4}$ mile from the shore.

The eastern hill over the southeast point of Ambrym in line with the west extreme of Pau Uma, bearing 31° , leads $\frac{1}{2}$ mile westward of Mary Stewart Reef.

Anchorage.—There is excellent anchorage on the west side of the island, opposite a black sand beach at the opening of a big valley which runs in to the back range of the island. It is further recognizable by a small cave half blocked up by stones at the southern extremity of the beach, known as the "Hole in the Wall."

Anchor in about 10 fathoms, black sand, with the west extreme of Pau Uma 186° and the Hole in the Wall 113° . The shelter is excellent and the holding ground good. The squalls occasionally come down heavily off the hills, and sometimes at high water a heavy swell sets in for a short time. Labor vessels sometimes anchor close off the reef, farther to the northward, but there is no swinging room.

A mission station exists about 1 mile to the northward of the anchorage off the Hole in the Wall.

Tidal streams.—At the anchorage the flood runs to the southward and the ebb to the northward, but off the Mary Stewart Reef the stream divides, and the ebb runs to the southward and eastward around the south end of the island. There is generally an eddy inshore and heavy tide rips off the corner of the island. Between Pau Uma and Lopevi the ebb sets to the southward.

Natives.—The west side of the island is fairly populated, and the natives appear to pay great attention to their fruit gardens, from the large clearings that may be seen dotted about over the sides of the hills. A new spot being selected each yam season, and the fences quickly sprouting the hillsides in places look like overgrown fields with thick hedges. At the northwest corner of the island the natives, in 1893, were very suspicious, and even threatening, but were quickly reassured, and always friendly afterwards; however, they should be treated with the greatest caution, as this corner has been notorious for attacks on boats of labor vessels. At the anchorage and everywhere else around the island they were perfectly friendly at that time. At Southeast Point during the great hurricane of 1893, a Frenchman and his native boat's crew were cast ashore and were treated with the greatest kindness for some days until picked up. The natives of Pau Uma have had a bad reputation among the natives of the neighboring islands.

Lopevi.—About 10 miles northeastward of Epi is a magnificent volcanic cone rising to a point at a height of 4,755 feet, and there is a small crater at the summit. The last eruption, according to the natives, was in 1883. The steep slopes are covered with casuarina trees up to a height of nearly 3,000 feet, except on the northeast and southwest sides, where a narrow lava flow reaches down to the sea. A small projection shows as a peak 2,910 feet high on the northern slope, and over the south point of the island is a rounded hill 2,430 feet high, close to which is said to be a fresh-water lake. On the east side, just within the shore, is a small cone 615 feet high.

There are no known offlying dangers, and everywhere the shore is steep-to, with no signs of coral reef. A depth of 500 fathoms was obtained a little over 1 mile from the shore on the east side of the island. Anchorage was frequently sought for, but not less than 30 fathoms could be found at a ship's length off the shore. In consequence the summit was never visited, though, according to the natives, it can be easily ascended in a day, starting from the southwest side. Landing is almost impossible, except on the west side where the water is always smooth during the trade wind, and landing easy. The summit is nearly always in the clouds, but on the few occasions when visible forms a most imposing sight.

The nearest place a vessel could anchor, and that only in the finest weather, would be on a 30-fathom patch of volcanic deposit $4\frac{1}{2}$ miles 178° from the summit of Lopevi.

Ambrym is an island 24 miles in length east and west by about 16 miles in breadth north and south, situated 12 miles northward of Epi. At the eastern end of the channel between are the islands of Lopevi and Pau Uma, already described. The island is of mountainous aspect, densely wooded, and appears to be entirely volcanic. In the center are several conspicuous peaks which apparently surround an enormous crater.

The summit, Mount Marum (Bwe ma ope), 4,380 feet high, is usually covered with cloud. In 1894 Mount Benbow Volcano was unusually active. In 1893 Volcano, a rounded hill 1,190 feet high, near the southeast point of the island, was seen in activity; steam could frequently be seen issuing, and its eastern slope was covered with a light yellowish deposit. There are hot springs at various places around the coast.

Mount Tuyio, on the northern end of the island, about 3,820 feet high as seen from the northwest, has a beautiful and imposing appearance from its symmetrical shape and the luxuriant vegetation on its lower slopes. Minnei Peak is a conspicuous coned hill, 1,245 feet high, over Dip Point, at the western end of the island.

The natives of Ambrym appear to be of a similar race to the natives of Malekula, with which island communication is occasionally carried on in big canoes. The western part of the island seems to be fairly populated and the natives friendly, wherever the influence of the mission at Dip Point has penetrated. Little or nothing is known of the natives along the southern and east coasts, and they should be therefore treated with caution.

Supplies.—Little can be obtained except a few yams, bananas, etc.

Coast.—Southeast Point is a bold bluff, surmounted by a hill 590 feet high, on which is a conspicuous tree, forming the end of the range which runs the whole breadth of the island. A short distance northward is Point Desolee, about 70 feet high. From Southeast Point for 3 miles southwestward the coast is at first very rugged with offlying rocks above water, the sea breaking heavily and landing impossible. It then trends nearly west by north and is low and flat without any remarkable features for 9 miles to D'Estrees Point, in a succession of rocky points and sandy bays with offlying patches of reef. At 6 miles east of D'Estrees Point is Black Rock Point, with fairly good landing through a break in the reef just to the westward.

D'Estrees Bank extends eastward from D'Estrees Point to $1\frac{1}{2}$ miles 122° from the shore, with depths of from 2 to 5 fathoms, the

outermost patch of $2\frac{1}{2}$ fathoms lying $1\frac{1}{4}$ miles 161° from D'Estrees Point. It is composed of sand and apparently formed by the rapid washing away of the low earthy cliffs forming the eastern side of the point.

D'Estrees Point is a sandy point fringed with casuarina trees, forming the south point of Ambrym.

The coast thence trends northwest for 15 miles to the west point of the island. For the first 4 miles it is a sandy beach with no offlying reef, the sea breaking heavily, with no landing except on the smoothest days, at a small bold point 35 feet high (*La lin da*), 1 mile eastward of which is a small copra station named *La lem bu*. Two miles westward of *La lin da* Point there is a bay $\frac{3}{4}$ mile deep, named **Port Vato**.

Port Vato.—Off the eastern point of Port Vato a reef extends 400 yards. On the western side of this point and opposite a copra station (*Lone o wei*), with a banian tree at the back, is a fairly good anchorage in ordinary weather, in 8 fathoms, with the banian tree in line with Tower Mountain behind, bearing 77° , and the high trees on the eastern point in line with the center of *Pau Uma* 122° . The water shoals rapidly toward the point. Off *Sa na sup* Point, on the western side of the bay, are some rocky ledges 10 feet high and steep-to. At $1\frac{1}{2}$ miles northward of Port Vato is a conspicuous coast hill, 860 feet high, named the *Morne*.

From Port Vato to the northwest the shore is rugged and rocky, with deep water close in to the shore. About $2\frac{1}{2}$ miles from the point is a copra station named *Bat in*, where there is landing for boats.

Close to the landing place at *Bat* and almost covered at high water is a hot spring from which clear water bubbles out at a temperature of 107° F. There is said to be another one at *Bau lap* farther along the coast.

Belbin Bay.—At 2 miles northwest of *Batin* is *Belbin Bay*. At *Craig Point*, 2 miles westward of *Belbin Bay*, the coast turns to the northward for $\frac{1}{2}$ mile to *George Point*, the shore line being fringed with a narrow ledge of rocks above water.

Craig Cove, about 1 mile southward of *Dip Point*, affords anchorage in about 17 fathoms, with just room for one vessel to swing at single anchor during the trade wind. A reef about 100 yards wide extends around the bay. *George Point*, the southern point of the bay, is rocky and about 20 feet high, with a detached rock close off it 6 feet high.

The shelter is very good during the trade wind. A vessel can also anchor a little to the northward of the cove in 14 fathoms. *Oceana Point* is the name given to the bluff on the north side of *Craig Cove*. The anchorages in this cove are only available for small vessels.

Dip Point, the westernmost point of Ambrym Island, is at the extremity of a small sandy beach under a dip in the cliffs, which here rise abruptly from the sea to a height of about 200 feet, at the extremity of two spurs from Minnei Peak, with a deep gulley between. The cliffs appear to be formed of compressed volcanic ashes and sand in layers.

Dip Point, the westernmost point of Ambrym Island, is at the site the copra station on the east side of the mission from 600 to 800 yards offshore. The most convenient place to anchor will be found to be in about 7 fathoms, black sand, with the boathouse bearing 187° , and Lamb Point 240° , at 300 yards from the edge of the foul ground. Two white posts in line about 176° lead to the landing place through the reefs. They are about 4 feet high and carry fixed white lights when required.

During the trade wind, unless when blowing hard from southeast by south, the wind on the northern side of Ambrym follows the coast and comes in during the afternoon as a sea breeze from the northeast by east, causing a break on the reefs along the shore. There is landing through a narrow passage in the reef, a few yards wide, just eastward of the boathouse, which is a conspicuous object on the beach.

The Presbyterian mission station, Ranior, is barely visible from the sea and stands a short distance back from the boathouse.

There are numerous villages in this part of the island and the valleys are extensively cultivated.

A good hospital with a limited accommodation for Europeans is situated near the landing place.

Caution.—Recent volcanic eruptions have entirely altered the coast line and offlying depths over a large area between Dip Point and Rowo Point. The hospital, mission house, and trader's house at Lon nol were all destroyed.

Tidal streams.—The flood sets to the westward and the ebb to the eastward.

Rowo Point.—At $1\frac{1}{2}$ miles eastward of Lamb Point there is a bold bluff 740 feet high, off which there is deep water close to the shore.

Rannon (Rhanone) anchorage is situated on the northwest side of Ambrym, about 12 miles eastward of Dip Point. There is a copra station here, and a vessel can anchor off it in about 7 fathoms, black sand, 300 yards from the beach, which is bordered on the north side by black cliffs and on the south by a small rocky point. The sea breeze sets in here from the northeastward, and the best anchorage is reported to be found under the cliffs about 1 mile north of the rocky point, where the water shoals gradually over a dark sandy bottom.

Rodds anchorage is 2 miles northward of Rannon and just westward of the north point of the island, off a hut on a small sandy beach.

This being the only white beach in the vicinity, is easily recognized. The soundings decrease gradually from 20 fathoms, sandy bottom. It is considered a better anchorage than Rannon.

Mission.—On the north point of the island is a station of the French Marist mission.

There is anchorage off the mission in 12 to 15 fathoms, black sand, westward of a black rock on the reef. The holding ground is good and the water smoother than would be expected from the configuration of the land, but the stream runs from 1 to 2 knots, and a good scope of chain is necessary.

The following directions for this anchorage are given by the master of the steamer *Tambo*: Steer in with Catholic mission house 159° until the rock on the reef, 8 feet high, is well open of Eastern Point 114° and Met an wa Point 249°. Anchor in 9 fathoms, with 300 yards swinging room. He adds, it is unworkable between half ebb and half flood.

Met an wa Point.—Off this point the reef extends 250 yards, on the outer edge of which a rock dries 4 feet.

Tides.—It is high water, full and change, on the north coast of Ambrym about 6h. 0m.; springs rise about 4½ feet. The tidal streams are weak, the flood to the westward, and the ebb to the eastward, from 1 to 2 miles per hour.

Selwyn Strait is between Ambrym and the south point of Aragh Aragh (Pentecost); the passage is 5½ miles wide and seems to be clear.

Aragh Aragh (Pentecost or Whitsuntide Island) is 34 miles long and about 6 miles wide.

Only that portion of Pentecost between the south point of the island and Steep Cliff Bay, some 25 miles up the west side, has been surveyed.

Pentecost is everywhere densely wooded and has no distinctive features, except near the south end of the island, which is very irregular in outline, and where numerous mountains in the center of the island rise to between 2,000 and 3,000 feet, and the hills are much broken up by ravines. Otherwise it appears to consist of a series of parallel straight ridges running north and south.

The west side of Pentecost is apparently of upraised coral, and from the absence of black volcanic beaches along the shore none of this side of the island, at any rate, is likely to be volcanic.

The island is very well watered, numerous good-sized streams occur along the coast, and, unlike in other islands of the group, seem always running.

The island is probably fairly thickly populated.

This is a favorite recruiting ground for labor vessels, and during their visits the bushmen come down from the hills in large numbers.

In recent years there have been several murders near Steep Cliff Bay and consequent punitive expeditions by naval vessels. At Fan Mara Mara Point, the southwest corner, the natives also have a bad reputation, according to the traders, and caution should be used all along the coast in dealing with them.

According to all accounts of 1893 cannibalism was then very prevalent.

Supplies.—Few clearings for gardens can be seen from the sea. Bananas, yams, native cabbage, and pineapples may be obtained in small quantities.

Tides.—It is high water, full and change, at 6h. 0m. (approximate); springs rise about $4\frac{1}{2}$ feet.

The streams along the western coast are very weak, but the flood appears to set to the northward and the ebb to the southward.

West coast.—**South Point** is a prominent point of reddish cliff, at the extremity of which is a rock 20 feet high. The water is deep off it.

Martelli Bay is situated on the east side of South Point.

The local steamer occasionally anchors here, but the bay is encumbered with coral patches, and with no shelter whatever, unless the wind is to the northward of east, and it therefore can not be recommended. From Martelli Bay the coast is rocky and bold for nearly 4 miles northeastward, as far as Tree Rock Point, off which is a rock with a tree on it. Beyond here the coast was not examined, but several high rocks were seen stretching off it a few miles farther on.

Between South Point and Fan Mara Mara Point, $2\frac{1}{2}$ miles to the northwest, there are fringing reefs and offlying patches out to $\frac{1}{2}$ mile from the shore. Unless the light is good, a wide berth should be given when passing, as the patches outside the line of reef will not be visible.

Fan Mara Mara Point is a bluff point 570 feet high with a conspicuous bush on the summit and a rock close off 25 feet high, off which the reef extends out for nearly 400 yards.

Two houses are situated about $\frac{1}{4}$ mile southward of this point, and a conspicuous Roman Catholic Church, with a tin roof, about midway between Fan Mara Mara Point and South Point.

Homo Bay, locally known as Ban Mat Mat, extends from Fan Mara Mara Point to Mushroom Rock. Three-quarters of a mile to the northward of the point is a small rocky bluff splitting the sand-beach, and 600 yards 257° from this point is a coral patch about 200 yards in extent with 2 feet of water over it.

The anchorage is to the northward of this small point in about 8 fathoms, and 400 from the shore, off the mouth of a small river, close

to which are some copra huts. In the northern corner of the bay are several patches of rocks dry at low water close to the beach.

Good water can easily be obtained here from the river.

The house of the agent of the New Hebrides Co., which may be seen on the shore of the bay, is a good mark.

There is good landing on the beach in fine weather.

Mushroom Rock, 30 feet high, forms the north point of Homo Bay. A narrow fringing reef about 200 yards wide extends off it.

Truchy Point is a rounded sandy point, $3\frac{1}{2}$ miles farther to the northward, where a trader lives.

There is anchorage off the copra hut in 7 to 8 fathoms, with good holding ground. The 2,355-foot hill ends very abruptly at its south-west corner, and is a most conspicuous mark. Steer in with its bluff extreme 94° . The beach is quite clear of reef. All along the coast the water is deep close in. The beaches are all of white coral sand or occasionally loose stones, but there are a few distinctive features.

Casuarina Point, $1\frac{1}{2}$ miles to the northward of Truchy Point, may be recognized by the casuarina trees growing along the shore.

At $4\frac{1}{2}$ miles north of Casuarina Point is a fine waterfall through a cleft in the hills which only shows to seaward between the bearings of 21° and 55° .

There is anchorage off the waterfall in from 9 to 10 fathoms, sand, at 200 yards outside the 3-fathom line. The bottom is fairly flat between 3 and 5 fathoms, but outside that there is a steep fall into deep water, and a vessel is liable during the night, when it is generally calm, to drift over and foul the anchor, and then with the first puff off the land in the morning to drag off.

On the north side of the anchorage is a very conspicuous light-colored square patch on the rocks close to the water.

From here to the northward a narrow fringing reef, about 200 yards wide, extends along the shore.

Flat-topped ranges about 1,200 feet high run parallel to the coast, falling steeply to the sea, and the shore gets more rocky and bold. At $1\frac{1}{2}$ miles northwestward of the waterfall is a low rocky point.

Whale Point is a bluff rounded point with a fairly conspicuous hill over it 1,400 feet high, with a green patch on it.

Grotto Point, $3\frac{1}{2}$ miles to the northward of Whale Point, forms the south end of Steep Cliff Bay. There is a mushroom-shaped rock close off it, 20 feet high, just to the northward of which is a small cave under the cliff. Over the point is a conspicuous summit, 1,070 feet high, with some grassy patches on it.

Steep Cliff Bay extends from Grotto Point 2 miles northward to Lifu Point. It can be recognized by a patch low down on the cliff on the south side of the bay just over a small white sand beach close

to Grotto Point. There is also a conspicuous bare white patch on the south side of Lifu Point.

There is good anchorage for one vessel in about 12 fathoms in the center of the bay, 250 yards outside the 3-fathom curve.

A fringing reef extends around the shores of the bay, and there is one small offlying patch just inside the 3-fathom curve, 150 yards from the shore, and 250 yards northward of Toadstool Rock.

A small stream enters the bay opposite the anchorage; water can be easily obtained.

Lifu Point is a sharp bold point at the north end of the bay, off which the reef extends 300 yards.

Mamurame Bay.—The bay just northward of Lifu Point is Mamurame. The reef extends 200 yards off the trader's house and around the bay. A rock lies off the mission station in the northeast corner of the bay.

There is deep water in the bay, suddenly shoaling to 12 and 8 fathoms, then gradually to 4 fathoms off the reef. The trader's house is $\frac{3}{4}$ mile, the French mission house about 2 miles from Lifu Point.

Steer in with trader's house 139° or conspicuous gap in hills 156° till Lifu Point bears 240° . Anchor in 12 fathoms with 300 yards swinging room.

Lama Langa (Raga) is about a mile south of northern point of Pentecost Island.

Mission house is near the center of the bight with a white sand beach; it is difficult to distinguish on account of trees. Steer in with mission house about 112° , anchoring in 15 fathoms.

Temporary anchorage can be obtained off this mission station, situated about 2 miles southward of the north extreme of Aragh Aragh, in a depth of 12 fathoms, at 300 yards from the edge of the shore reef.

Large vessels can anchor farther out, as the depths gradually increase. A white beacon, with diamond-shaped top mark, has been erected on the shore at $\frac{1}{4}$ mile north of the mission house. Vessels should steer in with this beacon bearing 66° .

The above directions are given by the master of the steamer *Induna*.

East Coast.—While sailing along the east side of this island it appeared to be free from danger, but the shore is bordered by a narrow reef which renders landing impossible nearly throughout. About the middle of the island a small recession in the coast line, protected on the east side by a reef, appears to offer an anchorage, but it has not been examined.

Maewo or Aurora Island, the northeastern island of the New Hebrides Group, is about 30 miles long north and south and about

2,000 feet high, with a neck of low land between the northern and southern ranges, and is separated from Aragh Island by Patterson Passage about 4 miles wide. Like Aragh and Ambryn, it is rich and fertile, abounding with coconut palms. The north face of the island is nearly 2 miles wide east and west, with a bight in the middle. A small flat rock lies about 670 yards off the northeast point, but this appears to be the only danger. A white beach, protected by a fringing reef, runs out for a few hundred yards toward the rock.

Landing with smooth water was found here, and there is a village close-to, whose inhabitants are in communication with Star Peak Island (Meralav). The northwest point of Maewo Island is low, with the usual coral shore; it is steep-to.

There is a Melanesian mission station at Tanrig, on the northeast side of the island.

Half a mile eastward of the southeast point is a small islet 40 feet high, with trees on its summit.

Caution.—The French naval vessel *d'Estrées* furnished a report that there are two patches of coral 1 mile off the north end of the island.

Lakarere, on the western side, is about 8 miles from the northwest point. It may be known by the rising land after passing the second platform from the north; there is also a conspicuous knob on the coast range, some 2 or 3 miles to the southward of it, found to be convenient as a mark by night. The double waterfall, which is about $\frac{1}{2}$ mile inland, is conspicuous on nearing the anchorage, but does not open coming from the northward until it bears 77° , on which line it is recommended to anchor.

Anchorage.—The *Miranda*, in 1884, anchored in 8 fathoms, with the waterfall bearing 88° and the north point of land 353° , holding ground good.

In ordinary fine weather the water is smooth, but though vessels may anchor when it is blowing fresh outside, there is then a short sea, and the puffs come off strong at an acute angle from the land.

Water.—It is difficult for boats to get into the fresh-water stream at neap tides, but at springs they can enter from two-thirds flood to one-third ebb (care being taken to keep clear of the patches), and bale in the water from a rushing stream.

Natives from the different inland villages assemble at the stream. They are friendly, but being all armed with bows and poisoned arrows, care is necessary, when bartering, to avoid causing a collision among themselves, as local quarrels appear to be the normal state of things in these islands. Taro and coconuts are abundant, but few yams can be procured.

Shoal.—The master of the *Southern Cross* reports the existence of a shoal, with a depth of 3 feet on it, lying about 2 miles 324° of Lakarere, and about the same distance offshore, but its exact position could not be determined.

Betarara anchorage is situated 9 miles southward of Lakarere. The bight is fronted by coral heads to about 200 yards offshore. There is anchorage in about 8 fathoms, with Double Rock, 10 feet high, bearing about 88° , distant 400 yards.

Narovorovo.—The next known anchorage is about 3 miles southward of Betarara and 10 miles from the southern end of the island. The locality may be recognized by its being abreast of the low neck of land which nearly divides the island, south of the northern range. Here a boat may get within two or three times her own length of a fine running stream, but an engine and hose, or other suitable means, must be employed. The island does not appear to be populous.

This is a far preferable anchorage to Lakarere. A good position will be found in 12 fathoms, nearly opposite the rivulet and 800 yards from the shore, with the southwest point of the bay bearing 122° .

A shoal which breaks at half tide lies 600 yards to the southward of the above anchorage and a similar distance offshore. The shore of the bay is foul to the distance of 200 yards, and a patch which dries 4 feet lies that distance southwest of the rivulet. Rocks from 5 to 10 feet high front the north shore of the anchorage, and Bastion Rock, 35 feet high, lies off the south extreme of the bay.

Tides.—It is high water, full and change, at Narovorovo at 6h.; springs rise 5 feet.

Aoba (Lepers) Island (the latter name being probably in consequence of the prevalent skin disease being mistaken for leprosy) is about 17 miles long northeast and southwest and 7 miles in extreme breadth. Its magnificent mountain, rising to a height of 4,000 feet, resembles a whale's back in outline, and from the sea assumes a most imposing appearance.

The coconut trees are numerous and grow at a great height up the mountain as well as round the shore. The yam and taro plantations are more numerous than on the other islands. On the summit of the island is a lake, and near its center a small crater which often emits smoke.

The shores are steep to (except the northeast point). The east coast is bordered by black rocks which render the landing from boats difficult and often impossible during easterly winds, but the natives on that coast communicate with vessels by means of their small canoes.

Big, or Devil, Rock is a high columnar rock, with a little foliage on the summit, situated off the southwest point of this island.

Coast.—Between Big Rock and Duin-dui Anchorage the coast is rocky, the hills over it sloping gently from Whales Back Mountain. A conspicuous hill rises over the southwest point of the island, and there is another noticeable hill midway between that point and Duin-dui.

Tides and tidal streams.—The flood tide sets to the northward along the coast of Aoba, generally causing a choppy sea.

Strong streams and races are found in the channel between this island and Maewo Island.

The natives on the north end are numerous and friendly; toward the west end they are not black, but brown. They are a manly and intelligent people and go in their canoes as far as the island of Santo.

Anchorage.—Many points on the north coast are frequented by the schooners which trade with the island, where they find anchorage, a description of which is given below. The British naval vessel *Wolverene*, 1878, anchored in four places upon the north coast and found good landing.

Water is said to be obtainable from a bight immediately to the westward of the northeast point, the only known place for the purpose.

Supplies.—An abundance of yams and coconuts are grown on the island, but in consequence of the swell on all the beaches it is difficult to land from a ship's boat; and the natives, though apparently energetic, have not yet accustomed themselves to bring off supplies in their canoes, which, though numerous, are small.

North coast—Reef.—The northeast point of Aoba is surrounded by a reef which stretches $\frac{1}{2}$ mile to seaward. It was probably a head of this reef which was reported as an isolated danger lying 335° from the northeast extremity of Aoba and 54° from the wedge-shaped yellow clay cliff separating Cliff and Barree Bays. It should be given a wide berth.

Cliff and Barree Bays are situated near the north extreme of the island. There is a copra station in Cliff Bay which can be seen from the offing; also the white shingle beach on which the boats land is remarkable between the black rocks which border the shore. The beach is protected by small patches of coral between which boats pass. Landing is generally easy.

Barree (Lolowai) Bay is nearly filled by a shallow coral flat. There are three or four black rocks standing on the flat.

Only a superficial examination of this bay has been made, but anchorage will be found outside the flat, between the yellow cliff point and the rock, 6 feet high, on the eastern side of the entrance, with the extremity of the yellow cliff in a line with the west point of Cliff Bay. A depth of 12 fathoms will be found midway between

the points mentioned. This is probably the anchorage reported as being the best in the island.

Mission.—There is a station of the Melanesian mission in Barree Bay.

Bice Road is an open anchorage, about 2 miles westward of Cliff Bay, with a depth of about 10 fathoms at 300 yards off the reef which fronts the shore to the distance of nearly 200 yards.

Walurigi is situated about the middle of the northwest coast and 5 miles westward of Bice Road. The holding ground is not good there. The *Miranda* anchored in 11 fathoms and dragged into 40 fathoms. There is a trading station here which does not show well from the offing. It is near the eastern end of the beach and to the westward of a narrow rocky point which divides the black beach. There is always a surf on this shore.

About $\frac{1}{2}$ mile northeastward of Walurigi the *Miranda* observed a reef situated 1,400 or 1,600 yards offshore.

Fatu Combane.—At 5 or 6 miles from the west point of Aoba Island some very high cliffs will be seen, and under the highest part, at some several hundred yards to the eastward of a small rocky shore recessed in the cliff, there are depths of 12 to 16 fathoms at 400 or 600 yards offshore. The bottom is black sand. Above the cliffs stand the villages Wassissiga and Pongolato, and at the other side of the rocky shore above mentioned stands Laputi village. Landing may be effected on that shore, but it is sometimes very difficult.

Duin dui lies about 6 miles southwestward of Walurigi and about 4 miles from the southwest end of the island, but owing to the broken and uneven nature of the bottom the anchorage is not good; the water deepens so rapidly that it is necessary to anchor close in to the shore. This anchorage may be found by steering for a conspicuous conical hill about 3 miles from the southwest end of Aoba and, as the coast is neared, steering for the first white beach to the eastward of this hill.

This is another copra station about 1 mile from the last mentioned. Landing is generally difficult. The white beach of Lorni is to the eastward of the east point of Duin dui, where there is another station.

Lorni.—From Duin dui the coast trends northeastward, and forming Lorni Bight, which lies under the slope of the whaleback of Aoba, terminating very abruptly at Lorni Bluff, situated approximately 9 to 10 miles eastward of the west extreme of Aoba. A trader lives here. A depth of about 15 fathoms will be found 400 yards offshore, quickly shoaling to 7 fathoms then very gradually to the beach. Steer in with trader's house (near which stands a conspicuous white trunked tree) 167° , anchoring in 14 fathoms 400 yards from the shore.

Two miles west of Lorni Beach is a trader's house with a galvanized iron roof. Landing bad.

Rock.—A pinnacle rock, with 5 feet water, was reported by the steamer *Tando* to be situated about 5 miles 324° of Lorni Bluff, with a depth of 30 fathoms close-to. The information was from an unknown source, not reported. It is marked P. D. on chart.

Nabutri village lies about $1\frac{1}{2}$ miles northeastward of the high rock situated close off the southwest extreme of Aoba. The French Government ship *Le Bruat* anchored off the village in $18\frac{1}{2}$ fathoms, sand and coral, with the high rock bearing south and the point near Duin dui (the extremity of the land to the eastward) 49° . That position was about 200 yards from the shore. At 100 yards farther out the depth was 54 fathoms. It is a bad anchorage, the bottom is very unequal, and it may be said that the ship was hooked onto the shore rather than anchored.

Walaha.—About $1\frac{1}{2}$ miles farther east there is another trading station, which is not seen from the offing; it is below a small double hill. An anchorage may be found there as bad as at Nabutri at about 200 yards from the shore.

General remark.—All the points above mentioned are difficult to recognize from a distance, except the yellow cliff at the east end and the cliff at Fatu Combane to the westward. Those assist to find the others.

East coast—Landing.—The east coast appears to be free from danger, but there is no anchorage at any part, and it is unapproachable by boats, except at the one place near the middle of the coast line. There landing may be effected in moderate weather under the lee of a point of rocks which project about 100 yards to seaward.

To the northward of that point there is a large beach of yellow sand with black rocks scattered over it. To the southward there is a small beach of yellow sand which will not be seen when approaching from the northward, being hidden by the rocky point.

The entrance to the creek is strewn with patches of coral, between which it is necessary to pass in order to reach the beach for landing just to the southward of the inner part of the point. At low water the passage is dangerous even with but a little swell. Formerly the position was marked by a basket painted white and fixed to a pole, which appeared as a beacon. There is a copra station which is visible from the offing.

Maskelyne Islands are a group of low islands standing on extensive coral reefs forming the southeast part of Malekula. Good anchorage is to be obtained among them, and there is an excellent passage through them, with good leading marks forming a convenient short cut for vessels rounding the south extreme of Malekula.

Approaching the group from the southward, a cluster of cone-shaped mounds on Wu lei will first be noticed, 200 to 300 feet high, then Sakau, 320 feet, and Ku li vu, 140 feet high, both flat-topped islands, and lastly Ko i vu, which is the easternmost and most outlying, as well as the lowest of the group (50 feet).

Most of the islands as well as the mainland westward of them appear to be formed of a kind of hardened volcanic mud, of the appearance of sandstone.

Caution.—When making for the Maskelyne Group seamen should remember that the outermost islands are comparatively low and difficult to see at night or in thick weather.

Inhabitants.—A few natives live along the shore and on the various islands, but the villages are very small and generally hidden away among the trees. They appear to live by fishing and collecting shell on the reefs. They are quiet, inoffensive, and partake more of the manners and customs of the natives of the south coast than of those of the east coast of Malekula, notably with regard to the curious custom of artificially compressing the skull into an elongated form.

Ku li vu and Ko i vu, the southeasternmost islands of the group, stand on an extensive coral reef 3 miles long north and south by 2.3 miles wide, with numerous stones and small patches of mangroves on it. The reef extends for nearly 1 mile to the southward and southeast of Ko i vu, and in it are several inlets which afford shelter for boats or very small craft.

Ko i vu is an uninhabited mangrove swamp 1,350 yards long north and south, with two coconut clumps on a slight rise at its southern extremity. The tops of the trees are only 50 feet high, and it is difficult to see at night.

Ku li vu, $1\frac{1}{4}$ miles long north and south by 1 mile wide, is of similar description, with a flat, wooded rise 140 feet high, having a few coconut trees on the summit, 30 to 46 feet high, in the center of the northern part of the island. There are a few inhabitants.

Sakau, which is the largest of the group, is 2 miles long, 1,350 yards wide, and from 200 to 300 feet high. The summit at the northeast end of it is 325 feet in height. At one time it is said to have been thickly inhabited, but is unhealthful now (1893), and there are very few left.

A fringing reef about 200 yards wide surrounds the island, projecting 800 yards on the northeast side. On either side of Sakau are good passages leading through the group.

Cape Doucere, the southeast extremity of Malekula, is a low, flat mangrove point, with a coral boulder 10 feet high just in front of the mangroves.

Gaspard Point, $\frac{1}{2}$ mile southwest of the cape, is a bluff point forming the southern extremity of the coast range between here and Port

Sandwich. The hill over the point, 495 feet high, is marked by a banian tree, which shows well from seaward.

From Gaspard Point southwestward the shore line, which is marked by mangroves, fringing reefs and offlying patches, is backed by densely wooded ranges of hills 300 to 600 feet high. On the west side of Gaspard Point is an inlet nearly 1 mile deep, useless for other than small craft, as there is a barrier of sunken rocks in the fairway. A vessel could anchor just inside the mouth in 12 fathoms under the corner of the spit of reef that extends 600 yards off Gaspard Point, but a good light would be necessary to avoid the reefs and the northern Fairway Patch in picking it up.

Fairway Patches are two coral patches, each about 200 yards in extent, lying in the center of the channel 1,000 yards southwest of Gaspard Point, with 1 fathom water on the northern patch and 3 fathoms on the southern one. Martin Point lies 1 mile southwest of Gaspard Point.

Cook Bay is on the southwest side of Martin Point. The fringing reef extends 500 yards from the shore and is difficult to see. It is not recommended for anchorage. From its northwest corner a path leads over the hills to the head of Port Sandwich, about an hour's walk, passing by Cook Hill, 500 feet high, with three large banian trees close together, and from whence a view into both Port Sandwich and the Maskelyne Group can be obtained.

Off the entrance of Cook Bay and 800 yards west of Mboa noan Point on Sakau Island, is a coral patch 200 yards in extent, drying at low water.

Serguey Point, fringed with mangroves, is the extremity of a spur of hills on the west side of Cook Bay. A small hill, 210 feet high, overlooks the point. A French trader had a copra station close to the point in 1893, trading principally in shell from the reefs.

South of Serguey Point, on a long point of reef stretching out from the mainland toward Sakau, are three small islets. Lembui, the western and largest, is 275 feet high and is connected at low water to the next islet, Aboi, 160 feet high, on the eastern side. The southern point of Aboi is bold and off it is a small rocky ledge 2 feet high. U len dre, 85 feet high, the easternmost islet, is of cliffy appearance. All three are densely wooded and, with the exception of Lembui, uninhabited. The reef extends 900 yards 77° from U len dre, covering at high water. On the reef close to its easternmost point are two patches of white sand dry at low water.

Off the reef on the north side of U len dre is a large coral patch drying at low-water springs, and 1,000 yards 77° of Serguey Point are two small detached patches with 5 feet on them; but a stranger should not attempt to anchor westward of the above patches unless with a good light or at low water, when all the reefs are visible.

Anchorage.—The only good anchorage in the group is off the sand beach south of Mboa noan, the west point of Sakau. Here, although the depths are somewhat irregular, a vessel will be out of the tide and anchored or moored in 15 fathoms sand and coral, with Cape Doucere in line with Mboa noan bearing 43° , and the south-west extreme of Sakau 167° will be quite protected from easterly winds.

Abreast Mboa noan the tidal streams are strong, and a vessel would be certain of a foul anchor.

The above is a close berth for any but a small craft; other vessels should moor.

Ui Island, 270 feet high, is the next southward of Lembui, and, except when viewed from the southward, appears to form part of the mainland; it is densely wooded and has a few inhabitants. Close to the south point, which is a steep bluff, is Pin Rock, 80 feet in height, a conspicuous sharp-pointed rock when seen clear of the land. The reef extends 300 yards off it. On the west side of the island, in a bight formed by the reef, is a perfectly sheltered anchorage for very small craft.

The coast from near Serguey Point trends southward to South Point, a bold bluff surmounted by a well-marked hill 355 feet high. At 250 yards off it is Tree Rock, a conspicuous rock 40 feet high, with a tree on the summit. The reef extends 300 yards from Tree Rock, and a spit of from 4 to 5 fathoms, generally marked by tide rips, extends in a southerly direction for another 400 yards. A conspicuous range of hills, of which Mount Maskelyne, 930 feet, is the highest, trends parallel to the coast.

Wu lei, the southern island of the group, lies 1,350 yards eastward of Tree Rock. It is 1,350 yards long north and south by $\frac{1}{2}$ mile wide. It is mostly low and swampy, covered with mangroves and coconuts, except the southern side, which is a ridge with several conspicuous cone-shaped hills, the highest of which is a double summit, 290 feet high, covered with fir trees, and falling precipitately into the sea at the southwest part of the island. Off the south and southeast sides are several small islets on the reef.

Si Ope is a small rounded hill, 150 feet high, at the northeast part of Wu lei. At high water it forms a separate islet.

Sulim Reef, on the southern extremity of which Wu lei stands, is composed of sand and weed, except at the edges, which are coral. It is $2\frac{1}{2}$ miles long and dries at low water. There are numerous small boulders of coral on the northeastern sides.

At 400 yards off the north extreme of the reef is a patch partially dry at low water.

There is an indentation on the west side of Sulim Reef just north of Si ope, where a vessel could anchor in 18 fathoms, if necessary;

but it would not be advisable to try and pick it up when the reefs are covered, as the tide then sets across the reef.

Directions.—There is an excellent deep-water passage through the group, with good leading marks, that a stranger could easily pick up.

Entering by the east channel between Sakau and Ku li vu, the reefs will be easily seen breaking on either side. The north extreme of Ku li vu, in line with the southern hill of Wu lei (110 feet), bearing 226° , leads through the center of the entrance until the south point of Aboi, which shows as a well-defined yellowish steep point, is in line with a small nipple in the first dip northward of Mount Maskelyne, bearing 251° ; which, being steered for, leads in the fairway and 200 yards southward of the shoals on the south side of Sakau. The reef on the Ku li vu side is steep-to but not always plainly visible. Follow this mark until U len dre is approached, and when the extreme of South point is in line with Pin Rock off Ui Island bearing 226° , steer for it until the east extreme of U len dre is in line with Mboa noan Point. This leads in midchannel through Southwest Channel and well to the westward of a 6-fathom patch that lies 1,200 yards 226° from the summit of Wu lei. Off Pin Rock the channel is only 600 yards wide, but the reef on this side is always plainly visible.

If about to proceed into the anchorage off Mboa noan Point, when the west extreme of Sakau is abeam, keep the first single banian tree to the right of the three banians on Cook Hill in line with the center of a gap in the mangrove formed by a point at the end of a spur of the hills on the west side of Cook Bay bearing 319° . This channel is barely 600 yards wide, but the edge of the point of the reef off U len dre is generally visible. As soon as the conspicuous banian tree over Gaspard Point is seen in line with Mboa noan Point steer for the anchorage with Cape Douceré in line with Mboa noan Point, one of the anchorage marks already described.

Northeast and South Channels.—As no good marks can be given for these channels, they are not recommended, and strangers especially should avoid them.

Tides and tidal streams.—The tidal streams run strongly through the channels of the Maskelyne Group, as much as 4 knots at springs in the narrow parts of the channels, the flood stream setting to the southward and westward, the ebb stream in the opposite direction. When the reefs cover, the streams have a tendency to set across them instead of in the direct line of the channels, so that careful attention must be paid to leading marks. When passing from one channel to another the different streams often meet nearly at right angles, which must be allowed for.

It is high water, full and change, at Mboa noan Point at 5h. 30m. (approximate); springs rise about 5 feet.

South coast of Malekula.—The south coast of Malekula is principally remarkable for the abundant coral growth extending from the Maskelyne Islands, 7 miles westward. It is everywhere bordered by ranges of hills parallel to the coast, with further ranges extending into center of the island. The only conspicuous peaks are Ba rai tova, 1,675 feet; Mount Goodenough, 2,200 feet; and Nub Hill, 595 feet in height.

From South Point, at the entrance to the southwest channel through the Maskelyne Islands, the coast trends westward for 1 mile and then turns northwest, forming the eastern side of a bay 9 miles across to Limban Point, with numerous small islands and coral patches.

Inhabitants.—The natives along the south coast are of a decidedly more intelligent and better-looking type than those of any other part of Malekula. The custom of bandaging the skull during childhood to give an elongated shape to the head is everywhere practised. They were always found to be most friendly and obliging in 1893.

Tidal streams.—Off the southwest part of the island the flood stream was found to set to the southeast by south, and the ebb vice versa; but this is probably an eddy, as everywhere else along the coast the usual direction is preserved, viz, the flood to the westward and the ebb to the eastward.

Islets.—**Lem bru**, 3 miles westward of South Point, is a small sand cap 3 feet high, standing on a coral reef which extends from it 1,200 yards northward and 600 yards southward.

Vi to is a small islet about 250 yards in extent, covered with trees, and about 50 feet high, standing on a narrow reef extending 300 yards northward and 1,800 yards southward.

Limaning is a small islet about 200 yards in extent, similar to Vi to.

None of the above islets is populated.

These three islets are situated at the eastern end of the bay, which is a mass of coral reefs and patches and could only be navigated from the masthead with a good light.

Hambi, situated in the middle of the bay about $\frac{3}{4}$ mile from the mainland, is about $\frac{1}{2}$ mile in extent, 110 feet high, densely wooded, and fairly populated. On its southeast side the reef extends about 1,200 yards, with a small islet on it about halfway out.

There is fair anchorage on the north side of Hambi for one vessel close off the island in 7 fathoms, sand and coral, with Mount Maskelyne in line with the northeast extreme of the island bearing 102° and the west extreme of the island 212° .

Care must be taken when approaching it from the eastward, as from the north end of the island a spit extends 600 yards northeast-

ward, and midway between the end of this spit and the nearest point of the mainland to the northeastward is a patch with less than 6 feet on it, and 400 to 600 yards in extent. Two-thirds of the way to the mainland from the end of the spit in a north direction is another small patch. The approach from the westward is quite clear.

Forlong anchorage.—Anchorage can be found in a depth of 17 fathoms off a bight on the south coast, at about 1 mile northeastward of Hambi Island.

Two beacons in line, bearing 32° , lead to this anchorage.

Besides the above two, there is a large patch nearly awash 600 to 800 yards in extent, lying 1 mile 229° from the west point of Hambi. This nearly always breaks heavily. One mile south of Hambi is a patch with from 7 to 10 fathoms.

One mile 313° from Vi to is a patch with from 4 to 10 fathoms, 800 yards in extent.

There are no further dangers westward of these.

Le mua is a small island about $\frac{1}{2}$ mile in extent, densely wooded, and 125 feet high. It is swampy and uninhabited.

Port Ravallec is the name of the anchorage between **Le mua** and the mainland. Shoal water and patches extend from the main for nearly 300 yards, narrowing the anchorage to little more than 200 yards. The anchorage here is in 6 fathoms, sand, with east extreme of **Le mua** in line with **Ba rai tova** (1,675 feet) bearing 72° and a big banyan tree close to the northwest point of the island 176° . There is no ship passage between the north point of **Le mua** and the mainland, as a shoal lies in the fairway.

The entrance around the southwest end of the island is clear, and this side can be safely rounded at a distance of $\frac{1}{2}$ mile. A leading mark recommended is the hill 235 feet in height in line with **Tanyok** low wooded sandy point 16° .

Coast.—About $1\frac{1}{2}$ miles northward of **Le mua** Island is a beach of pebbles at the head of the bay. A small river runs out here, draining the deep valley which runs back for several miles into the island, dividing Mount Goodenough from the ranges to the eastward. Another small river runs out into the west side of the bay. A few ducks may occasionally be found at the mouths of these rivers.

From **Limban Point**, $1\frac{1}{2}$ miles southward of **Le mua**, the coast is rocky and steep-to, with no fringing reefs, to **Ure Island**, 7 miles southwestward. It is broken up into two bays about 1 mile deep. At the northeast corner of the first bay there was a copra station in 1893. In the second bay there are anchorage depths, and it is apparently free of dangers, but too much swell always sets in to recommend it as an anchorage. Three-quarters of a mile north of the head of this bay is **Nub Hill**, 595 feet high, having a large banyan tree on

the summit, and forming a very conspicuous object from all along the south coast of Malekula.

Mi lipe Point forms the south point of Malekula and is at the eastern side of the entrance to Ure Island anchorage. A reef extends 400 yards southward of it. Between this point and Ure Island is a deep channel 1,100 yards wide.

Ure (Tomman) Island anchorage is between Ure Island and the mainland. It is free from danger, but westward of the north point of the island is a mass of coral patches, and a vessel should on no account attempt to pass through in that direction. The best anchorage is with Ayles Islet (43 feet) bearing 94° , distant about 600 yards, in 8 to 9 fathoms, sand and coral, with good shelter from the trade wind. Occasionally a heavy swell sets in through the passage, when a more comfortable anchorage will be found about 500 yards off the north point of Ure Island in 12 fathoms, sand and coral, with the east extreme of Ure Island 150° and the west extreme bearing 235° .

Tides and tidal streams.—It is high water, full and change, about 5h. 50m.; springs rise from 4 to 5 feet. The flood stream runs to the eastward and the ebb to the westward about 2 knots at springs.

Ure or Tomman Island is about $1\frac{1}{2}$ miles long by $\frac{1}{2}$ mile wide; it is densely wooded and nearly flat, except on the east side, where it rises to a height of 265 feet in a precipitous mass of upraised coral. It is thickly populated and the natives are quiet and inoffensive. It is surrounded by narrow fringing reefs on which on the south and southeast sides the sea breaks heavily.

Ta ma lant (Luther) Reef is a sunken coral reef about 800 yards long north and south, lying $\frac{1}{2}$ mile westward of Ure Island. There is a probable depth of 2 to 3 fathoms on it. Blind rollers occasionally break heavily and it should not be approached.

Lagoon.—On the mainland opposite Ure Island is a lagoon hidden in the trees, about $\frac{1}{2}$ mile long, separated from the sea by a broad strip of sand. It has a narrow entrance available for boats at high water only.

The coast now turns northwest. Off this point of the island and westward of Ure Island the water is comparatively shallow, and the 100-fathom line is nearly 3 miles from the shore.

Malekula—East coast.—From Cape Doucere, the southeast extreme of Malekula, the coast trends northwest for $3\frac{1}{2}$ miles to Lamap Point, which is the southern entrance to Port Sandwich. The first $1\frac{1}{2}$ miles of that coast is fronted by a belt of small mangroves, and from thence there is a white sand beach. About $\frac{1}{2}$ mile back from the coast there is a steep ridge of hills, rising suddenly from the low flat land. It is between 500 and 600 feet in height, thickly wooded and even-topped, appearing in the distance like a table-land, but

really broken up with ravines. The southern end of this ridge over Cape Doucere is 495 feet in height, and marked by a conspicuous banyan tree, which shows well from seaward. Near Lamap Point the hills recede to about $\frac{1}{2}$ mile from the shore.

Half a mile southeastward of Lamap Point is the Roman Catholic (Marist) mission station, a well-built house situated a few yards back from the beach on rising ground, and showing plainly when seen from the southeast. There are several villages near the shore between Cape Doucere and Lamap Point, the principal of which are Penap and Drevail, the former rather more than a mile and the latter $1\frac{1}{2}$ miles from Cape Doucere.

The whole of this coast is fronted by a fringing coral reef from 300 to 600 yards wide, uncovering in patches at low water springs. There is a small break in the reef opposite the mission station, where a boat can generally obtain a landing. This reef is steep-to, and may be safely approached to within 100 yards, the 100-fathom line being only 600 yards to seaward.

Caroline Bay—Anchorage.—Temporary anchorage may be found in a depth of from 8 to 10 fathoms in this bay at $1\frac{1}{2}$ miles northwestward of Ure Island.

Port Sandwich is a long narrow inlet rather more than 4 miles in length in a southwest by south and northeast by north direction, with an average width of about $\frac{3}{4}$ mile, and it is probably the best harbor in the New Hebrides, and is available for the largest vessels at all times. The entrance is rather more than 600 yards wide between the reefs, and is easy of access in any weather, while inside there is protection from winds in any direction, with a good holding ground of mud over a space of $1\frac{1}{2}$ miles by 600 yards wide.

Ashuk Head, on the western side of the entrance, is a prominent bluff 596 feet in height, well wooded, and in clear weather is easily visible from off Dip Point, the west end of Ambrym Island 12 miles distant. The land to the westward of Ashuk Head trends in to a deep bight named False Bay, which, in thick weather, might be mistaken for Port Sandwich.

East shore.—From Lamap Point, east side of the entrance, the coast line forms a bight, while trending to the southwestward for $1\frac{1}{2}$ miles to Observation Spot (which is on a slightly rounded sandy point); and from thence in the same direction 400 yards to Planter Point, which is a conspicuous white sand spit. The whole of this coast line is a white sandy beach, backed by thick vegetation almost down to high-water mark; but about midway between these points is a conspicuous coral cliff named Tambu Rock, 7 feet high.

A broad shore reef extends 500 yards northward of Lamap Point. It is dry at low water, and always shows by a slight break, even in the calmest weather, but on turning to the southward into the harbor

this reef is not so well defined unless with a good light, more especially after rain, when the water of the harbor is much discolored.

A reef extends 200 yards off the shore from Lamap Point as far as Observation Spot, and is much broken up along its outer edge, which is only awash in patches at low-water springs, so that it is often difficult to distinguish.

Fairway—Gedge patches.—Foul ground extends more than 600 yards to the northwestward of Observation Spot, and at its outer edge there are several coral heads covered by 4 to 5 feet at low-water springs. Gedge patches are quite steep-to on the northwest side, and as the water of the harbor is generally much discolored by the discharge from the rivers, it is seldom that these dangers are visible.

Buoy.—A red buoy surmounted by a cage is moored in 5 fathoms close to the westward of the outer rock, eastern side of the fairway. A light is placed on this buoy occasionally when local craft are expected.

Villages.—Nearly all the villages in Port Sandwich are situated a short distance from the coast, but do not show, as they are well hidden among the dense foliage; the principal are named Lamap, Levis, Bongau, Rambuan, Panishiish, and Meriver. The settlement belonging to the French New Hebrides Co. is situated just eastward of Planter Point, and consists of several well-built houses and stores with a short stone pier in front of the coal store. But very little of these houses can be seen from seaward on account of the trees.

From Planter Point the coast trends to the eastward 500 yards, and then to the southward nearly $1\frac{1}{4}$ miles (with several small bights) to Martin Point, which terminates in a low, sandy spit.

A rocky patch consisting of scattered coral heads covered by 3 or 4 feet at low water lies 350 yards 342° from Martin Point, and the water between it and the shore is shoal.

West shore.—From Ashuk Head, on the west side of the entrance, the coast, which consists of coral cliffs and then sand beach, with a few scattered mangroves, trend southwestward $\frac{3}{4}$ mile to Deep Point; the fringing reef which is about 100 yards wide, near Ashuk Head, contracts and disappears at 300 yards from Deep Point, where the coast is steep-to.

Middle Bay, lying between Deep Point and Pearl Point, is 1,200 yards wide, and recedes 500 yards. Its shore is formed of a white sandy beach, except at about 400 yards from Pearl Point, where there is a rocky point with a large white boulder on it, which is generally a conspicuous object.

The depth in Middle Bay is from 5 to 15 fathoms, shoaling gradually to the shore, except at one place opposite the middle of the beach,

where a coral reef almost awash at low water extends 100 yards from the shore.

A spit covered by 9 feet at low water lies opposite the white bowlders, extends nearly 200 yards from the shore at 450 yards 32° from Pearl Point, and is steep-to.

The land all around Middle Bay is well cultivated, tobacco and maize yielding large crops.

Pearl Point is 1,200 yards southwestward from Deep Point, at the end of a low spur from the hills, and fronted by a ledge of rocks which uncover at low water. A house belonging to the French Co. stands on the low ridge at 150 yards to the northward of the point. It has an iron roof and is a conspicuous mark from seaward.

Erskine River.—From Pearl Point the coast trends southward for 1,200 yards to the entrance of the Erskine River, which is not always easily distinguished, especially at high water. Boats can only enter the river after half flood, as there is a bar of mud and stone across the entrance which dries at low water; but inside the bar there is deep water for a considerable distance.

Water.—It is not advisable to water from the Erskine River, as a boat would have to proceed some distance up and wait until nearly the end of the ebb stream before loading, after which she would have to wait again for the tide to rise sufficiently to allow her to cross the bar. The water is of inferior quality.

Murder Stream.—From Erskine River the land trends to the southward 1½ miles to the termination of a small bay, which forms the western head of the harbor. On the western side of that bay there is a rivulet called Murder Stream, navigable by boats for nearly ½ mile, but can only be entered after half flood, as the entrance is dry at low water. There are several villages on its banks, inhabited by bushmen, and great care should be exercised when dealing with them, as they murdered a French subject in 1891 and have since been punished by the naval authorities.

Tongue Point lies 600 yards south of Martin Point, on the opposite shore, which together form the entrance to a long, narrow bay, extending 1 mile southward, and is 500 yards wide. The shores are fringed with mangroves on either side, and the depth of 4 fathoms at its entrance gradually shoals toward extensive mud banks, which dry at low water. At the head of the bay there is a small river which is navigable by boats some little distance. There is a narrow and shallow channel leading to the entrance, along the western side of the bay, between the mangroves and the mud flats.

Directions.—For entering Port Sandwich keep the house (if it can be seen) on Pearl Point just open of Deep Point 235° (or the white sandy beach partly shut in by Deep Point) until Ashuk Head

is abeam, then alter course to 227° , so as to pass 100 yards westward of the buoy; when the buoy is abaft the beam steer about south and anchor where convenient.

Tides.—It is high water, full and change, in Port Sandwich at 5h. 20m. Springs rise 4 feet 8 inches, neaps rise 3 feet 8 inches, and range 2 feet 8 inches. There is considerable diurnal inequality, affecting the high water approximately from 2 to 9 inches, the low water from 2 to 20 inches; the largest occurring with the moon's maximum declination. The usual sequence is from the higher high water to the lower low water.

Observation Spot is in latitude $16^{\circ} 26' 6''$ S., longitude $167^{\circ} 46' 56''$ E., depending on the Observation Spot at Nouméa being in longitude $166^{\circ} 26' 29''$ E.

Supplies.—Occasionally a small quantity of fresh meat and vegetables can be obtained. Tinned provisions, flour, etc., can be purchased at the French store. Traders occasionally obtain fish by using charges of dynamite in the shallow water near the settlement, but good supplies of fish can generally be obtained by hauling the seine on the flats in front of the Erskine River. An abundance of firewood may be obtained for the trouble of cutting it.

False Bay, in the northern approach to Port Sandwich, is 1 mile wide between Ashuk Head and Mbatnea Point, and recedes $\frac{1}{2}$ mile. There are coral reefs on each side extending about 200 yards from the shore, but the inner part of the bay is free from coral and the water shoals some distance out.

In the southern corner of the bay there is an entrance to a small river which is navigable by boats for some distance after crossing the bar, which dries at low water.

To the northward of that river the beach consists of fine black sand for $\frac{1}{2}$ mile; then the coral reef begins, and the beach all the way round to Mbatnea Point is composed of white sand.

On the reef off the south side of False Bay, 80 yards in front of the coral cliff, there is a large coral boulder 15 feet in height, with a tree growing on its top.

Behind False Bay there is a low flat valley densely wooded, with ranges of hills on either side, so that in thick weather it might easily be mistaken for Port Sandwich.

Crested Hill is a well-marked summit, 889 feet in height, with a conspicuous tree which shows well from all directions. It stands $\frac{1}{2}$ mile back from the inner part of False Bay.

Mbatnea Point is a well-marked bluff with a narrow strip of sand along the high-water line. It lies nearly 2 miles northwest of Lamap Point, and is fronted by a fringing reef 400 yards wide, which dries at low water.

Coast.—From Mbatnea Point the coast trends northwestward 4 miles to Bangon Point. The beach is of sand with some scattered clumps of mangroves, and fronted by a reef from 200 to 400 yards in width. It is quite steep-to and well marked by breakers. At $1\frac{1}{2}$ miles northward of Mbatnea Point there is a break in the reef opposite a deep and conspicuous ravine in the coast hills, through which a small stream flows into the sea. A French trader lives at the mouth of the stream, and his hut can be seen from seaward.

Bangon Point, which is low and thickly wooded, forms the eastern side of Sasun Bay. A coral reef extends nearly 600 yards to the northward of the point, and the outer edge is covered at low water. As the sea does not always break on it, while the tide ripples are sometimes confusing, a good berth should be given to the point when turning in toward Sasun or Aulua.

Sasun Bay is a convenient anchorage in ordinary weather, as there is good protection from the prevailing wind; but it is exposed between north-northwest and northeast. Care is requisite when entering, as the reefs on the eastern side are very irregular and do not show unless with a good light. A French trader is living near the inner part of the bay, but his house is much hidden by the trees.

There is a bank of coral with not less than 4 fathoms over it almost in the middle of the bay, and opposite the trader's house foul ground extends about 500 yards from the shore.

Anchorage.—The best position is in 7 fathoms, sandy bottom, with Bangon Point bearing 63° and the trader's hut 140° .

A good mark for approaching the anchorage is the trader's hut in a line with a small hill (which has a conspicuous dark banian tree on the top) bearing 134° .

Water.—Fresh water may be obtained from a spring. Also good water is obtainable from a small stream at the west side of the bay. Within two or three hours of high water boats could reach the beach near the stream, but at low water the reef uncovers to the distance of 200 yards.

Coast.—Between Sasun and Aulua Bays the coast is formed of rocky points with sand beaches between, and rising up steeply behind to the coast hills, which are all thickly covered with trees. The reef, which has several small breaks in it, extends from 300 to 500 yards from the shore.

Aulua Bay lies $2\frac{1}{2}$ miles west of Bangon Point. A Presbyterian mission station has been established there, but the house can only be seen from the northward. A good mark for recognizing this bay is a conspicuous white cliff which marks the southern end. In front of the mission station is a low projecting rocky point with a flagstaff on it.

Anchorage.—Good anchorage may be obtained off the mission house in 10 fathoms, sand and coral, with the flagstaff bearing 190° , distant 500 yards, and White Cliff 142° .

Water.—There is a stream of excellent water flowing into the sea close to the mission house, from which the local steamer generally obtains a supply. At low water the stream flows over a stony beach, and then a long length of hose would be required; but at high water there is no difficulty in loading the boats.

Landing.—Access is obtained to the mouth of the stream through a gap in the fringing reef, but as the shore dries out some distance at low water it is more convenient to land after half flood.

Coast.—On the west side of Aulua Bay the reef, which uncovers at low water, extends 700 yards from the shore, and near its outer edge there is a coral boulder 6 feet in height.

Royalist Point is a conspicuous black rocky point at the end of a steep spur northwest of Aulua Bay. The fringing reef passes close to Royalist Point, but lying at 600 yards 49° from its extremity there is a patch with 4 fathoms over it, and as the water in the vicinity is generally much discolored it is best to give the point a good berth. To the northwest of Royalist Point the reef and foul ground extends more than 600 yards. Westward of it is Assen Bay, where fairly good anchorage may be obtained in 7 or 8 fathoms, quite protected from the usual trade wind. The line of approach recommended is Mount Seggatt bearing 190° , anchoring in 7 fathoms.

Mount Leggatt is a conspicuous dome-shaped summit 1,769 feet in height, situated $2\frac{1}{2}$ miles southwestward from Royalist Point. It is a good mark by day or night from the northward or southward, being so much higher than the surrounding hills.

Mansa Reef (Evans Shoal) is a dangerous patch of coral lying 1 mile to the northeastward of Royalist Point and midway between Bangon and Bongnaun Points. It consists of several patches of coral covering 1 mile in extent. The middle patch has some growing coral heads on it covered by only 4 or 5 feet at low-water springs, but unless with a good light this danger is rarely visible, and should therefore be given a wide berth.

Mount Leggatt, in line with the left extremity of a rocky cliff on the north side of Aulua Bay, bearing 229° , leads south of Mansa Reef. Mount Leggatt, in a line with the right extremity of the rocks of Royalist Point, bearing 204° , leads north of Mansa Reef.

When passing up or down the coast, a 317° course from outside the reef off Bangon Point to pass clear of the reef off Bongnaun Point, or vice versa, will give Mansa Reef a berth of $\frac{1}{2}$ mile, so that no danger may be apprehended unless having to visit any place inside that bight.

Winsor Patch is a small coral patch with a depth of 4 fathoms over it, situated nearly midway between Mansa Reef and Bongnaun Point, with Bongnaun Point bearing 305° , distant 1 mile. It is steep-to around and only shows under most favorable circumstances.

Tesman Bay, $2\frac{1}{2}$ miles northwestward of Royalist Point, affords excellent anchorage with northerly or westerly winds, but while the prevailing trade wind is blowing there is always a considerable swell setting in. An English trader is (1893) settled there, and the local steamer generally stops to communicate with him on her way north. By steering 235° in toward the middle of the bay, anchorage can be found in 6 fathoms, with Royalist Point bearing 125° .

Bongnaun Point.—From Tesman Bay the coast trends sharply to the northeastward for $1\frac{1}{2}$ miles to Bongnaun Point, which is a low wooded spit with a white sandy beach. Namal, a fringing coral reef, which dries at low-water springs, extends for $\frac{3}{4}$ mile northeastward of the point. It is steep-to around, and its eastern edge shows well by the sea breaking on it, but the northern edge is not so well marked, as the water is discolored and generally smooth. There are usually considerable tide ripples off that point when the ebb tide is running down against the wind, which makes the reef appear to extend farther seaward than it really does.

Pangkumu Bay.—From Bongnaun Point the coast trends to the westward and southwestward for 2 miles to the inner part of Pangkumu Bay, where there is a station of the Presbyterian Mission. The house shows well from the northward and is a good mark for approaching the anchorage. A large black boulder on with mission house 179° leads up to a convenient anchorage. Close to the westward of the mission house there is a steep bluff of a reddish color.

The reefs extend for about 200 yards from the shore on the east side of the bay, and ends abruptly close to the westward of the bluff.

Anchorage.—The best anchorage is in front of the mission house in 7 or 8 fathoms, white sand, with a large black boulder on the reef in line with the house bearing 179° and two conspicuous coral boulders on the reef toward Bongnaun Point in line 69° . There is excellent protection there from the trade wind, and the water is quite smooth.

Mount Morton is the northern summit of a wooded ridge close behind the mission station, which shows well from seaward, as it is much in front of the other hills; and on its northern side it drops steeply to the flat plain.

Coast.—To the westward of Pangkumu Bluff the hills recede from the coast, leaving an extensive plain, low and thickly wooded, with a large shallow lagoon close to the coast which is frequented by wild ducks in certain seasons of the year. The Rueme River, a considerable stream, flows from the mountainous district and along the eastern

side of that valley, finding an exit $\frac{3}{4}$ mile westward from Pangkumu Bluff. There is a small sand and stone spit on the east side of the entrance of the river which uncovers at half tide, while a bar extends across the entrance with barely 2 feet over it at low water. There is a considerable flow of water from it, especially after rain, but it can not be navigated more than $\frac{1}{2}$ mile or so by boats on account of several shallow fords.

Rukumbo.—From the mouth of the Rueme the coast, which is a white sandy beach, trends northwestward for 2 miles to a small stream, near the mouth of which there is the large village of Rukumbo. A schoolhouse with native teacher has been established there and the inhabitants are friendly with Europeans.

From Rukumbo a coast of sand beaches and rocky cliffs trend northward for $1\frac{1}{2}$ miles to the mouth of the small Unua River. A conspicuous black rock, awash at high water, is situated at the mouth of this river. The mission house is a conspicuous white building, situated on a hill northward of the entrance to the river. A fringing reef about 200 yards in width fronts this coast. Outside the line of reef the water is deep. There are two conspicuous black coral boulders on the reef. The northern and largest is 15 feet in height.

Opposite the Unua River there is a break in the reef where landing can nearly always be effected. There are considerable villages along this coast both north and south of the river, the natives of which were very glad to exchange pigs and yams for tobacco and trade goods.

From the Unua River to McNabb Bay several villages are hidden among the trees near the coast, which is fronted by a fringing reef about 300 yards wide, through which there are one or two breaks where landing may be effected.

McNabb Bay is a small bight in the coast about 1 mile wide and receding $\frac{1}{2}$ mile. The reef ends abruptly on each side of the bay, and anchorage may be obtained near the center at 400 yards from the shore in 12 or 13 fathoms, sandy bottom; but the water is very deep outside the anchorage and there is usually a considerable swell during the southeast trade.

Nomarit River is a considerable stream during the wet season. It flows into the southern corner of McNabb Bay. A French trader has settled near its mouth, doing a small business with the natives in exchange for copra. A valley runs back more than 2 miles from McNabb Bay to the slopes of Mount Gillan, which has a dome-shaped summit 2,407 feet in height.

Meadus Bay is another indentation in the coast very similar to McNabb Bay and is $1\frac{1}{2}$ miles northwestward of it; but the depth of water is not so great at the entrance, and diminishes more regularly to the sand beach at its head, where there is no fringing reef. The

small Sarmet River flows into Meadus Bay, but can not be entered by boats on account of the sand bank across its entrance.

Anchorage may be obtained almost in the middle of the bay, in from 6 to 10 fathoms, at 600 yards from the shore; but in not less than 6 fathoms.

Wreck Point.—Between McNabb and Meadus Bays the coast is fronted by a reef about 400 yards in width, which dries a foot at low-water springs. From Meadus Bay the coast trends northward $1\frac{1}{2}$ miles to Wreck Point, which is a low rounded promontory thickly covered with trees and having a white sandy beach. The fringing reef extends 400 yards from the shore on its eastern side and 800 yards to the northward, drying from 1 to 2 feet at low-water springs.

Taio Point is low and covered with mangrove, with some small scattered bushes growing on the fringing reef which extends 500 yards eastward and nearly $\frac{1}{2}$ mile northwest, drying in parts as much as 2 feet at low-water springs. Taio Point is $3\frac{1}{2}$ miles northwestward from Wreck Point. The coast line between recedes and forms two bights, which are only separated by a spit of mangroves. The eastern bight is Crab Bay and the western Bushmans Bay. The land all around these bays is low and densely wooded. The first ridge of hills rise from the plain about $\frac{3}{4}$ mile from the shore.

Crab Bay is so named from the numbers of land crabs to be found in the vicinity; is mostly filled with coral reefs, but having a snug and quiet anchorage in the middle. The shores are thickly lined with mangroves, so that beyond the fact that good anchorage may be found here, there is no object in visiting the spot, especially as there are but few natives about.

The northern side of the bay is inclosed by the Eliza Mary, an extensive coral reef, which dries from 2 to 3 feet at low-water springs. A few small mangroves grow on this reef, and doubtless in a few years they will extend considerably, and form a better protection to Bushmans Bay.

The entrance to Crab Bay (which is only about 300 yards wide) is between the point of the reef off Wreck Point and Eliza Mary Reef. There are no good marks for entering, so the eye is the only guide; there is no difficulty in ordinary weather. The head of the bay is very much obstructed by patches of coral, some of which uncover at low water, though it would be quite possible for small craft to find their way into the southeastern corner of the bay, where they would be quite landlocked and able to ride out a hurricane.

The anchorage in Crab Bay is about $\frac{1}{4}$ mile inside the entrance in 14 fathoms, sand and shell, with the left extreme of Wreck Point 99° , the right extremity of Sandy Point 156° .

Bushmans Bay is a deep bight open to the northeast, 1 mile wide, and recedes $1\frac{1}{2}$ miles. The head of the bay has a sandy beach with

trees growing close down to the water line. There is no reef there, but the water is somewhat shallow in front of the beach, the 5-fathom line being more than 400 yards off. The sides of the bay are lined with mangroves, and fronted by a narrow fringing reef, which is steep-to.

Bushmans Bay was much frequented in former days by the labor vessels, as it provided a convenient and safe anchorage, while the natives from the surrounding districts, extending as far as Uripiv Island, came down to the beach and engaged as recruits, or bartered yams, etc., for trade goods.

Anchorage may be obtained anywhere near the head of the bay, but it is not advisable to get too close to the southeast corner, as the water shoals rather suddenly to a broken reef, which does not usually show. The best position is opposite the middle of the beach, where a small stream finds its way through the sand. The depth there is 10 fathoms over muddy bottom, with the east side of entrance in a line with Wreck Point 99° , and the north side of the entrance 18° .

Mount Helen is a peak 2,045 feet in height, standing 4 miles southwestward from Wreck Point. When approaching from the southward the first patch of light-green grass occurs near the seaward end of a long spur from that summit, and is a very conspicuous object, looking like a large field surrounded by dark trees; but it can not be seen to the northward of Wreck Point. Several other extensive open patches of grass occur on the northern slopes of Mount Helen. At the foot of the mountain there is a broad valley penetrating far toward the middle of the island.

Sharp Peak is remarkable, 2,765 feet in height, and stands $3\frac{1}{2}$ miles southwestward from Mount Helen. It shows well from seaward to the northward of Bushmans Bay.

Brigstocke Bay is a small indentation in the coast on the west side of Taio Point, where small vessels might find temporary anchorage. As in the outer part of the bay the reefs are steep-to on either side. The inner part of the bay is shallow, with many coral heads, and only practicable by boats.

From Brigstocke Bay a mangrove coast extends 1 mile northwest to Mangrove Point, and is fronted by a drying coral reef from 200 to 400 yards broad. This reef is steep-to and its edge well marked by breakers.

Mangrove Point is the extremity of a projecting tongue of low land covered by mangroves, $2\frac{1}{4}$ miles northwestward from Taio Point, from whence the coast turns abruptly to the southward into Port Stanley.

Uri is an island situated on the drying coral reef extending northwest of Mangrove Point. It is $1\frac{1}{4}$ miles long and about 670 yards wide, the southeast point being $\frac{1}{2}$ mile from Mangrove Point. The

eastern end is the highest part of this island, which is 109 feet to the top of the trees. It is faced by a steep coral cliff, above which there is a village among the trees, a few of the huts showing to seaward.

Nanuit, the western part of the island, is a mass of mangroves with a white sand point at its extremity. The fringing reef extends for 400 yards to the northward from the eastern end of Uri, and near the outer edge there is a conspicuous coral boulder 12 feet in height. The reef then closes the land, until at the western point it is only 100 yards wide; but off the sand spit the reef and foul ground extends about 300 yards westward.

Uripiv is a small island, nearly circular in shape and $\frac{1}{2}$ mile in diameter, lying $\frac{1}{2}$ mile northward of Uri, from which it is separated by a deep channel more than 800 yards wide.

Like Uri, this island is highest at its eastern end, where there is a coral cliff about 15 feet high, and the highest tops of the trees are 121 feet above high water. There are no mangroves around that island, and the beach is generally of white sand with trees growing close to the water's edge.

There is no reef in front of the mission station, and the shore is very steep-to, but from thence to the eastward there is a fringing reef which gradually extends from the shore until it attains a width of 400 yards off the eastern point, outside which there is a spit of shoal water for another 100 yards before it drops off into deep water. Off the north coast the reef is 400 yards wide, drying 2 feet in most parts at low water, with a conspicuous coral boulder 10 feet in height nearly in the middle. On the western side the reef again approaches the shore to within 200 yards and is steep-to.

The only position where swinging room is afforded, even for a short ship, is off the mission house, just to the eastward of the reef which terminates at the western point, in 17 fathoms, sand and coral, with the extremes of Uripiv 111° and 24° . The water was always quite smooth at that anchorage, while the island did not cut off the refreshing trade wind.

Mission.—A station of the Presbyterian mission has been established on Uripiv, the house being situated on the southwestern side near the beach. There are several small villages scattered about the island.

Port Stanley is the name given to the expanse of water lying behind Uri and Uripiv Islands, but on account of the depth of water it can not be considered a good harbor, though there are several places where anchorage may be obtained. It is 6 miles long in a northwest and southeast direction, with an average width of $1\frac{1}{2}$ miles, and its southern extreme is only divided from Bushmans Bay by a narrow neck of land 600 yards in width.

Nearly all the shore around Port Stanley is fringed with mangroves, and the harbor is studded with several islands and numerous patches of coral reef. It is but little frequented by vessels, as there are not many natives around its shores and no supplies are obtainable.

Tautu Point forms the western side of the entrance to Port Stanley. It is a bold bluff promontory and lies $1\frac{1}{2}$ miles westward of Uripiv Island, on the opposite side of the entrance. It is fronted by a fringing reef 200 yards in width, on which there is a coral boulder 14 feet in height.

A large village is situated on Tautu Point, the natives of which are friendly to Europeans, and a native teacher from the mission on Uripiv has been established there.

Good bay is a broad, open bight $\frac{3}{4}$ miles in each direction. Shoal water and broken ground extend for more than 200 yards from the southern shore. Aop River flows into the head of the bay, but can not be entered by boats.

Anchorage might be obtained, if necessary, in from 10 to 14 fathoms at the head of Good Bay, but it is not a convenient position for a sailing vessel, being so far to leeward of Uripiv Island and the entrance of the harbor.

From the head of Good Bay it is only about 5 miles across to the western side of Malekula, this being the narrowest part of the island. A valley runs across from shore to shore, making it an easy walk along the track used by the natives.

From Good Bay the western shore of Port Stanley trends about 5 miles southeastward to the head of the harbor. The greater part of that coast is fronted by mangroves, and the hills rise steeply above it, thickly covered with trees.

Taitaka is a small low island of mangroves and bushes, 400 yards long and 200 yards wide, situated on a drying coral reef nearly in the middle of the harbor, and is steep to all around. Near the western end there is a sand cay about 2 feet above high water, and several large black coral boulders.

Suwarro is a low islet covered with trees and surrounded by a fringing coral reef, which dries in patches at low water, and there is a patch of foul ground extending 600 yards 302° from it.

Suwan is a small mangrove islet lying close to the shore at 800 yards to the southward of Suwarro. The reef between it and the shore dries in patches at low water, while a reef extends for nearly $\frac{1}{2}$ mile to the southward. Foul ground extends across from Suwarro to Suwan, navigable only by boats.

Directions.—With a favorable light a seaman could easily pick the way to the inner part of Port Stanley, but the eye should be the only guide; directions are useless.

Anchorage.—The best position in Port Stanley is near the south side of Uri Island, at 300 yards from the shore, on a small patch of 12 fathoms, sand and coral, with the extremes of Uri Island 63° and 319°. There the water was smooth, the full benefit of the trade wind appreciated, and there are but few mosquitoes.

Norsup is a low wooded island lying 1 mile to the northwestward of Tautu Point, and is uninhabited.

Malekula, north coast—Aspect.—The general aspect of the coast between Uripiv Island and North Cape is a low coast line, with mountainous ranges at the back from 1,000 to 2,000 feet high, densely wooded up to the summits, with occasional patches of light green grass on the lower ranges. Several thickly populated islands lie about $\frac{1}{2}$ mile off the coast, with a clear passage between them and the mainland, forming convenient anchorages. These islands being low and wooded, they are indistinguishable at a little distance from the mainland.

West of Uripiv Island there is a break in the hills, leaving Wainisi Hill and some low hills to stand out boldly in the gap. This, the narrowest part of the island, is only 5 to 6 miles across. Thence to the northward the hills rise from about 1 mile inshore, in ranges running back to a height of 1,900 feet, forming the backbone of this part of the island. Lalembe Hill is a prominent peak, 1,745 feet high, 4 miles inland. On this summit is said to be a powerful stronghold of the "bushmen" in this vicinity. On the same range, 2 miles nearer the coast, is Batelembe, a prominent hill with a double summit, 1,145 feet high.

Rarab, 1,660 feet high, is another conspicuous summit when viewed from the northward.

The Northern Range, of which Rubina, 1,190 feet high, is the southern summit, is in most parts clear of wood, covered with grass, and shows out prominently. Westward of North Cape the aspect of the land is entirely different, being mostly a table-land covered with grass and only wooded in patches, not unlike English park land at a little distance. In the vicinity of Espiegle Bay and Malua Bay deep canyons run back into the hills for a considerable distance, and being full of trees form prominent objects. Southward of Malua Bay the table-land rises to a height of 2,000 feet, showing from the northward as a broad, flat summit.

On account of the difficulty of visiting the summits of the hill little is known of the geological formation in the vicinity of Malua Bay. The table-land is of coral limestone formation, and probably the curious green patches on the other side of the island are the same, but it is difficult to account for the absence of trees.

The general character of the soundings, except in Bougainville Strait, opposite North Cape, is deep water right in to the shore; bot-

tom, mostly coral débris. The fringing reefs are usually plainly visible, rendering navigation by day safe and easy.

Natives.—The natives can be divided into the "saltwatermen" and the "bushmen," between whom there appears to be unceasing war. The offlying islands are densely populated by the former, who live there for the sake of security. They possess numerous canoes, in which they cross over to the mainland opposite every morning to cultivate their crops of yams, bananas, etc., being careful to return before dark. Some of the canoes are very large, have a triangular matting sail, and are used in trading expeditions to Malo Island and Ambrym. Fishing is confined to spearing fish at low water on the reefs.

They are a wild, savage race and have the reputation of being treacherous, but of late years more frequent intercourse with white men and the presence of resident missionaries has done much to modify this. In the presence of a naval vessel, at any rate, they always appear very friendly, having a good idea of the punishment that could be inflicted upon them in case of bad behavior.

Cannibalism is still occasionally practiced (1893). Nearly all are armed with sniders. Many having been to Queensland in labor schooners speak a dialect known as Beche de Mer English.

The "bushmen" live entirely among the hills in small villages and are seldom seen. Being practically secure from punishment, they have not the same reasons for good behavior that the "saltwatermen" have, and should, therefore, be always treated with caution. All villages being hidden among the trees, it is only by the smoke that their presence can be suspected.

Supplies.—Little or nothing can be obtained except yams, coconuts, and bananas. The natives possess many pigs, but do not seem to care to part with them, except the very small ones. Tobacco is used for barter.

Tides.—It is high water, full and change, at Wala Island about 1h. 10m. earlier than Tangoa Island (Espiritu Santo Island), or about 5h. 9m., with 1 foot more range, or 4 feet 9 inches; and at Vao Island about 53 minutes earlier than Tangoa, with 1 foot more range.

The flood stream sets northward and the ebb southward on the east coast, from 1 to 2 knots.

Norsup Bay.—From Tantu Point the coast trends westward, forming Norsup Bay, about 2 miles deep, at the head of which good anchorage may be obtained in about 10 fathoms, black sand, protected from all but northeasterly winds and much preferable to the anchorage off Uripiv Island.

Norsup Island is low and wooded, about 60 feet high, and $\frac{1}{2}$ mile long in a northeast and southwest direction. At the entrance to

Norsup Bay, surrounded by a fringing reef about 200 yards in width, there is a small village on it. There is a clear passage into the bay on the north side, 1,600 yards wide; that on the south side is barely 600 yards in width, and the bottom is very uneven.

Pinalum Point or Point Rouge, 2 miles north of Norsup Island, is a bold point about 40 feet high, steep-to on its east side, but a reef extends 400 yards on its north side. There is a small village on the point and the natives appear friendly, see above. From Pinalum Point the coast trends northwestward for about 7 miles to Ching on tara Point, being low and rocky, with occasional bays of black sand, into which the drainage from the high land behind finds its way in small streams generally blocked at the mouth.

Rano Island, $2\frac{1}{2}$ miles in circumference, of upraised coral, densely wooded, and about 100 feet high, it is inhabited. An English copra trader was living on the sandy spit on the west side of the island in 1892. A fringing reef about 400 yards wide extends around the north and east side. There is no anchorage off this island.

Wala Island.—Half a mile northwestward of Rano Island is a similar island about $1\frac{1}{2}$ miles in circumference, 150 feet high, surrounded by a fringing reef 200 to 400 yards wide, except the south point, which is of sand, and is inhabited. An English copra trader lives on the west side, and on the southeast side, standing well above the sea, is a station of the Marist Mission.

Very fair anchorage can be obtained just westward of the south point of the island, where the deep water extends right into the beach. The best berth for a single vessel is in 17 fathoms, sand and coral, with the left extreme of Rano Island in line with the right extreme of Wala Island and the left extreme of Pinalum Point in line with the low-water line of the sand spit on the west side of Rano Island. Vessels should not anchor in anything less than 17 fathoms.

Between Rano and Wala Islands there is a clear and deep channel 600 to 800 yards wide.

Atchin Island, $\frac{3}{4}$ mile long in a northeast and southwest direction by 670 yards wide and 120 feet high, lies about $2\frac{1}{2}$ miles northwestward of Wala Island, and is of a similar description but poorer and more thinly populated (about 500 to 600). A fringing reef extends all round, about 200 yards wide, except the southwest point, which is of sand and steep-to.

Fair anchorage can be had in about 15 fathoms, sand and mud, northwest of the southwest point, with the right extreme of southwest point bearing 133° and the left extreme of Atchin Island 60° .

Between Atchin Island and the mainland the deep water is on the Atchin side of the channel. The black sandy bays opposite Atchin Island and westward of Wala Island are considered by the natives

dangerous to land in on account of the "bushmen," who here come down to the salt water from the high land behind.

Croydon Reef, about 1 mile north of Atchin Island, is composed of sand and coral, about 400 yards in diameter, and has 4 feet on it at low water, when it usually breaks; but at other times it is difficult to see unless with a good light.

There is a clear passage westward of it, taking care to keep the southwest point of Vao Island (Vidil Point) shut in by Laron Point. From Ching on tara Point to Lara Point the shore is fringed with casuarina trees; the coast then turns nearly west for 6 miles to North Cape.

Bracey Patch, lying about 800 yards northeastward of Laron Point, is about 600 yards in diameter and composed of sand and coral. It has $1\frac{1}{2}$ fathoms at low water, and is not easy to see unless with a very good light; but vessels can safely pass between it and the mainland by keeping within 400 yards of the edge of the shore reef. Local tradition points to both the above-named shoals having only recently been submerged.

Vao Island, about 1 mile northwestward of Laron Point, is about $2\frac{1}{2}$ miles in circumference, 130 feet high, and densely wooded. It has a population of about 1,000. Close to the sandy spit forming the southwest point of the island (Vidil Point) is a station of the Marist Mission.

There is excellent anchorage about 400 yards west of Vidil Point in 8 to 9 fathoms, sand and coral, with Laron Point open of Vidil Point bearing 116° , sheltered from all but northwesterly winds; but in the event of the latter a vessel could always anchor on the other side of the point. Vidil Point is somewhat thickly wooded to the water's edge and can be safely rounded in 6 fathoms at 250 yards distant clear of the $4\frac{1}{2}$ -fathom shoal off the point. From the whiteness of the bottom (sand) the spit appears to run out shallow farther than it does in reality.

About 1 mile west of Vao Island is the little inlet Laruru, into the eastern corner of which a stream finds its way, and $\frac{1}{2}$ mile farther west and 800 yards from the shore is a small coral patch with 8 fathoms on it.

North Cape forms the northernmost point of Malekula, is steep-to, and just behind it a low flat-topped hill about 230 feet high.

Temporary anchorage may be obtained just westward of North Cape in Wo wo Bay, into the head of which a stream falls. There is anchorage in 12 fathoms, sand and coral. The village Wo wo, hidden among the trees, is on the east side of the bay, and there is a landing place here in a crevice of the rocks.

Malekula—West coast.—The western coast of Malekula between Malua Bay and Southwest Bay is little known, not having been sur-

veyed. It is moderately high, thickly wooded, and bordered with sandy beaches.

Eleven miles south of Espiegle Bay the land trends to the eastward, forming a deep bight, from which it extends in a southeast by south direction about 18 miles to Southwest Bay. Four miles north of the bay is a small islet, and between it and a point just to the northward a reef extends from the shore to a distance of $1\frac{1}{2}$ miles.

Espiegle Bay.—The *Espiègle* anchored on the west coast of Malekula, in 12 fathoms, with the south point of Espiegle Bay bearing 178° and a white patch on the south side of the gully at the head of the bay 130° .

Excellent fresh water can be obtained at all times of tide from a stream running into the bay at the southern end of the sand beach.

Olemam or Malua Bay, $\frac{3}{4}$ mile southward of Espiegle Bay, is an excellent small anchorage with good holding ground.

Good water may be obtained here from the river in the south corner of the bay. The natives seen here—"bushmen" living up on the plateau behind the bay—during the visit of the British naval vessel *Dart* appeared friendly and freely brought what little they had for barter; but they are of forbidding appearance, and, having had little intercourse with white men, should be treated with great caution.

Black Point, 1 mile southward of Malua Bay, consists of dark rocks. The next point is low, with small feathery trees, resembling stunted green pines, and is called Tree Point; then an indentation in the land terminates in Rock Point, with a conspicuous rock 18 feet high off it the most western point of the island. This rock is dark and conspicuous, standing well clear of the land on the reef. After passing the rock mentioned above, the next point is large, rounded, and sandy, also with the feathery trees on it. A small river has its outlet to the south of the point, which also has a reef extending 800 yards in a southerly direction.

Elephant Point, southeastward of Rock Point, is bold and conspicuous, strongly resembling an elephant. When abreast the point a detached rock resembling a miter, 60 feet in height, is seen just to the north of it. A reef projects from Elephant Point for some distance.

One Tree Point, southeastward of Elephant Point, was so called because of a remarkable tree growing nearly on the summit of a detached rock 68 feet high and at such an angle as to be more conspicuous than if it grew vertically. Off One Tree Point are three rocks, dark, and all showing above water; no dangers could be found near them.

About $\frac{1}{2}$ mile to the 167° of One Tree Rock is a detached rock 10 feet above water, black and flat topped; no dangers could be found around the rock.

First Point is low and rocky, with feathery trees, and with deep water up to the edge of the rocks. This neighborhood has not been surveyed.

Lambumbu is an inlet $\frac{1}{2}$ mile in length by 300 yards in width in its narrowest part. It is entirely of coral formation, coral reefs fringing the shore, backed by high limestone cliffs and thickly covered with trees.

The inner portion of the inlet on which the village is situated appears to be the lower part of a gradual slope from the hills. The bottom consists of coral, sand, and pulverized coral, with a depth varying from 15 fathoms in the entrance to 3 fathoms at $\frac{1}{4}$ mile from its head. The holding ground is considered fair. The water is clear, and the reef edge distinctly visible as far as the 5-fathom curve; from thence the water is thicker. The outer edges of the reefs break continuously. Lying here steam should be ready at short notice.

Approaching from the westward, Mount Evelyn, 860 feet high, a conspicuous, symmetrical, cone-shaped hill covered to the summit with trees, is the most noticeable feature. It lies $1\frac{1}{4}$ miles northward of the harbor.

The people are quiet and inoffensive, and most of them speak the usual *Bêche de Mer* English.

Supplies.—Good water may be had from the river northward of the village, as marked on the chart.

Yams, coconuts, pigs, and chickens can be obtained in small quantities. The natives are poor.

Coast.—From the southwest side of the entrance to Lambumbu the coast trends in a southerly direction, with a fringing reef extending from 200 to 600 yards off the shore as far as Pacey Point. The most noticeable feature before reaching the latter point is a conspicuous black boulder, 15 feet high, 300 yards offshore.

Pacey Point is the northern of a series of cliffs which are conspicuous from the westward, having the appearance of a straight line when seen from some miles offshore. On closer inspection the cliffs are found to be the terminal points of two deep bays, both of which have deep water and would not afford good anchorage. The northern of these two bays has a village and a conspicuous cave in the cliffs open to the westward. The southern bay may be recognized by a conspicuous, bare cone-shaped hill on its southern side. A river runs into the bay, and a village stands inshore of the sandy beach. The southern point of the bay is formed by a cliff with a large mushroom-shaped rock on the fringing reef, close to and off the

point. Nearly halfway between Mushroom Rock and Reef Point is a remarkable arch, shaped like the arch of a church, open to the westward, and estimated to be 80 feet high.

Reef Point, so named on account of the reefs off the point, is low, with trees on it.

From the northward the high land about 2 miles southward of Reef Point, within Cave Island Point, can be seen above these trees.

Dixon Reefs, four in number, extend 1 mile off Reef Point. The western and southern of these reefs are awash at half tide. The smaller center reef does not break. Depths of 1 to 3 fathoms were obtained on it. The fourth, a small detached reef, lies $\frac{1}{2}$ mile to the northward of Reef Point; this latter breaks.

Cave Island is about 180 feet high, covered with trees, the sides being precipitous and bare in places. The cave is 25 feet high and open to the westward.

The island is situated in the center of a bold bight, and connected to the shore by a reef, and a reef extends 400 yards off its eastern side. The point north of it has a reef extending about $\frac{1}{4}$ mile off. The island is not easy to locate as it merges with the cliffs behind it. These cliffs gradually slope toward the south, terminating in an apparently fertile valley.

A black sandy beach and then a very conspicuous white sandy beach with a remarkable white cliff on it are characteristic of the coast line as far as Hook Point.

Hook Point.—This point has gray cliffs on its northern and southern sides; the point itself is low. A fringing reef which breaks extends about $\frac{1}{2}$ mile from the shore.

Southwest Bay is 2 miles wide between Tufnell Bluff, the north point of the bay, and the reef upon which the sea generally breaks, extending 1,200 yards northward of the islet, 140 feet high, situated 400 yards off West Point, on the south side of the bay. The shores of the bay, except the southeast, are high and covered with verdure. The land to the southeast, where a lagoon is situated, is low and covered with a thick growth of trees. Fringing reefs extend from 400 to 600 yards from the shore.

Henderson's house, close southward of which is situated a shed with a tin roof, forms a useful mark when entering this bay.

The mission station at 400 yards northward of High Sandstone Bluff is situated on the slope of a bluff and is partly concealed by trees. The boathouse is a conspicuous white building.

The trader's house at 700 yards northward of the boathouse is partly hidden by trees.

Anchorage.—There is a considerable extent of anchoring ground, having a sandy bottom, well protected from all but winds from west through north to northeast in from 7 to 14 fathoms, with island off

the southwest point of the bay bearing about 265° , and the entrance to lagoon about 159° .

Directions.—In approaching Southwest Bay from the southward the island off the southwest point of the bay, which is conical in shape and 140 feet high, is easily distinguished when it opens clear of the high land of the promontory. By rounding this island at a distance of about a mile all dangers will be avoided. When the entrance to the lagoon in the southeast part of the bay bears 159° steer for it and anchor at a distance of about $\frac{1}{2}$ mile from the beach.

Tides.—It is high water, full and change, at 5h. 50m.; springs rise 5 feet.

Supplies are scarce, only a small quantity of fruit and vegetables being procurable. Wood pigeons abound near the lagoon.

Water may be procured from a cascade to the northeast of the anchorage, but it is not good.

Bougainville Strait is $7\frac{1}{2}$ miles wide and separates Malekula Island from Malo Island. It has depths of 55 to 80 fathoms in the fairway, and on the south side the bottom is uneven.

Pasco Bank lies in the center of the channel, having a least depth of 13 fathoms, coral. From it the summit of Vao Island bears 124° distant 8 miles.

Tidal streams.—The tidal streams run strongly through the strait the flood setting to the westward and the ebb to the eastward, forming heavy rips with the tide against the wind, especially off the southeast corner of Malo Island, where at springs the stream runs from 3 to 4 knots.

Espiritu Santo Island—General remarks.—Espiritu Santo, now commonly known as Santo Island, was discovered by Quiros, a Spaniard, in 1606, and by him named Australia del Espiritu Santo. The natives appear to have no general name for the whole island, but the southwest portion they call Marina.

It is very mountainous on its south and west sides, range after range rising up until a height of between 5,000 and 6,000 feet is reached. Everywhere up to the summit is densely wooded and there is an absence of the light-green grassy patches so noticeable on Malekula Island. The southeast corner, including the islands off it, appears to be entirely upraised coral, but the mountain ranges are probably volcanic, as some of the beaches from Tangoa westward are composed of black volcanic sand washed down from the high land at the back.

The peaks are usually covered with cloud. Santo Peak, the highest visible from the southward, is 5,520 feet high. Cone Peak, 2,790 feet high, is a prominent object from southeastward and is usually visible when the peaks are covered with cloud. Nub Hill is very conspicuous, 855 feet high, on the southwest extreme of the island.

On approaching from the southward Araki or Hat Island forms a most conspicuous object, being in the form of a hat and rising in distinct steps to a height of 830 feet. This is one of the many small islands scattered along the south coast.

Caution.—Though this island is very high, dependence must not be placed on seeing it at night till very close to the shore, as it is usually enveloped in mist during the night and morning.

Natives.—The coast is very thinly populated compared to Malekula Island, and by a smaller and inferior race of men. They possess few canoes. Such natives as were met with appeared very friendly, but they have the reputation of being treacherous and there have been many murders of white men in quite recent times, so they should be treated with caution. Cannibalism is probably more prevalent than in Malekula Island. The population appears to be decreasing.

Supplies.—Little or nothing can be obtained except yams, coconuts, and bananas, and pineapples when in season (October and November).

Communication.—A small French steamer from Noumea also calls off the French mission station on the east side of Malo Island and at Luganville in the Second channel about once a month.

Malo Island, lying off the southeast part of Santo Island, is about 8 miles long in an east-and-west direction and from 4 to 6 miles wide north and south. It is composed of an upraised plateau of coral 300 to 400 feet high, with some hills 800 to 1,000 feet high surmounting it on the western side, everywhere densely wooded. Malo Peak, 1,120 feet high, is prominent from all directions except southeast; coral was found on the top.

The natives are a decidedly inferior race to those of Malekula Island, and even those of Santo Island, both in appearance and ideas of morality. The population is probably between 2,000 and 3,000. They possess few canoes and mostly live on the elevated plateau, cultivating their yam gardens, etc.

The south coast is steep-to, with cliffs of coral limestone forming the edge of the plateau at the back. There is nearly always a surf on the shore, and landing can only be effected at one or two little inlets near the southeast point. The west coast trends nearly north and south, and here is situated the Presbyterian mission station Abuetare.

Anchorage may be obtained off the mission in 10 to 11 fathoms, sand and coral, about 400 yards from the shore reef with the left extreme of Malo bearing 63°, mission in line with Malo Peak 123°. The tide is felt here, the flood running southward and the ebb northward about 1 knot, and there is always more or less swell. Landing is bad at low water. The shore reef here is about 200 yards wide, widening to 400 yards $\frac{1}{2}$ mile to the southward.

Saone Patch, 600 yards off the shore, about 1 mile southward of the mission, is about 400 yards in extent. It consists of several coral heads having from 2 to 4 feet on them, with depths of 2 to 3 fathoms between. It only breaks in heavy weather.

Malo Killi Killi.—On the east side of Malo are some small islets about 100 feet high, about $\frac{1}{2}$ mile from the shore, to which they are connected by coral reefs.

North Malo Killi Killi is an uninhabited coral islet about 100 feet high, densely wooded, about 670 yards long north and south, with a small islet (North Islet) 5 feet high off the north end. A horn of reef extends 400 yards northwestward off North Islet.

Very good anchorage, except during northerly winds, may be obtained on the northwest side of North Malo Killi Killi, in 7 fathoms, sand and coral. Enter with the southwest extreme of South Malo Killi Killi in line with the eastern extreme of Fortuna, a bushy islet off it, bearing 171° and just before North Islet is abeam round to and anchor; this leads midway between May Rocks and the horn of reef off North Islet.

A slight swell nearly always sets round into the anchorage.

May Rocks, west side of approach, are isolated coral patches with two or three heads having from 5 to 9 feet on them at low water. From the easternmost rock North Islet bears 106° distant 1,450 yards. They are not easily seen even with a good light.

South Malo Killi Killi, 1 mile long north and south by 670 yards wide at 200 yards southward of North Malo Killi Killi, is connected with it at low water. It is about 100 feet high and thickly wooded; casuarina trees extend along the shore in places. Off the west side are two islets. It is connected with the mainland by a shallow flat on which are many coral patches with boat passages between them.

Opposite the south end of South Malo Killi Killi is Lachaise Point, which has a conspicuous single tree on it.

Jacquiers anchorage.—This anchorage is situated about 1 mile northwestward of Malo Killi Killi anchorage.

Directions.—Bring the east extreme of south Malo Killi Killi Island to bear 181° , and when the islet, 50 feet high, off the mission is abeam, steer 251° , anchoring in a depth of 11 fathoms, with the eastern extreme of that islet bearing 353° .

Mission.—From Lachaise Point the coast of Malo trends northwest for 2 miles, to the head of a bay about $\frac{3}{4}$ mile deep, where there is a station of the Marist mission. Off the mission there is foul ground for $\frac{1}{2}$ mile and a small islet about 50 feet high lies northeastward of it.

The French naval vessel visiting the mission generally anchors abreast of it, but there is little or no shelter.

North of this bay the coast trends northward for 2 miles to the northeast point of the island (Ned Point), and with the exception of a narrow fringing reef is steep-to.

It there turns sharply westward to the entrance of Malo Pass.

Wawa or Bruat Channel lies between the north shore of Malo Island and the south shore of Aore Island. It is about 5 miles long and varies from $1\frac{1}{2}$ miles in width to 470 yards at its narrowest point. From Ned Point, south side of the approach, the coast trends west for $3\frac{1}{2}$ miles to Su chun Lagre Island, having a fringing reef from 200 to 400 yards wide. One mile eastward of Su chun Lagre Island foul ground extends for about $\frac{1}{2}$ mile off the shore.

Anchorage.—Very fair anchorage could be obtained westward of this foul ground and eastward of Su chun Lagre, protected from southeast, in from 9 to 10 fathoms, coral, at about 800 yards from the shore, well within the strong tidal stream through the channel.

Su chun Lagre Island is about 1,200 yards long, parallel to the Malo shore, and about 115 feet high. Except at low water there is a passage behind the island very useful for boats when the tide is running strongly out in the channel. A creek runs from it inland for about $\frac{1}{2}$ mile to a shallow lagoon.

There are two conspicuous trees on the east end of this island, one a clump and the other umbrella shaped. Close off the east end of the island is an islet about 10 feet high.

After passing Su chun Lagre Island the coast trends nearly straight, with a narrow fringing reef nowhere more than 200 yards wide for 4 miles, when it commences to turn southwestward, forming the northwest point of the island.

There is a 4-fathom patch of sand 400 yards off the southern shore of the channel at 4 miles westward of Su chun Lagre Island.

North shore.—The south coast of Aore Island is low and thickly wooded, backed by an elevated coral plateau 300 to 400 feet high, from $\frac{1}{4}$ to $\frac{1}{2}$ mile inland.

Ratua (Sulega) Island, about 1,200 yards east and west and 800 yards north and south, is densely wooded, about 120 feet high, with a conspicuous single tree on it near the center of the island. Between it and the mainland of Aore Island is a narrow boat channel, the eastern end of which dries at low water.

At 800 yards eastward of Ratua Island and connected by reef to it are several bushy islets about 20 feet high.

Guichen Reef, south of the west point of Ratua Island, is a dangerous cluster of large coral heads 400 yards in extent, having 6 feet on them at low water and extending 600 yards from the southwest point of Ratua Island, causing this, the already narrowest part of the channel, to be still further contracted to a width of 470 yards. It is very difficult to see even in a good light, but can be safely

avoided by following the directions hereafter. The tidal stream sets across this reef with violence at times.

Port Lautour is a well-sheltered anchorage from all but westerly winds, and out of the tide on the west side of Ratua Island. A good position is in about 14 fathoms, sand and coral, with the left extreme of Turtle Island in line with the right extreme of Araki Island bearing 268° , but caution must be observed in picking up anchorage as there is foul ground with many coral heads, steep-to, extending 400 yards from the northern shore. From the anchorage a narrow channel carrying not less than 5 fathoms, 150 yards wide, extends into the sandy beach on the west side of Ratua Island, with reef and shallow water on either side. Here a small vessel could safely lie but would have to moor. This used to be a great resort of labor schooners for refreshment and careening purposes on the beach, close along side of which there are depths of 3 to 4 fathoms.

Rocks.—At 600 yards 122° from Duck Point, eastward of Ratua Island, are two isolated coral heads about 50 yards apart with 3 feet on them at low water, about 400 yards from the shore.

From Ratua Island to the westward the coast is nearly straight for 3 miles to Richards Point, the southwest point of Aore Island, with a fringing reef from 200 to 400 yards wide. South of Richards Point the reef extends about 600 yards off.

Southeast of the point of this reef there is a patch of sand 250 yards outside the reef, about 100 yards in extent, having $4\frac{1}{2}$ fathoms at low water. From it Richards Point bears 348° , distant 1,000 yards.

Turtle Island (Buro Mamasa), $1\frac{1}{2}$ miles west of Ratua Island, is of sand, surmounted by bushes. It is 60 feet high, about 200 yards long east and west by 100 yards wide, surrounded by a reef extending 600 yards in a long narrow spit from the west side. Vessels should not pass northward of Turtle Island except with a very good light, as it is only 550 yards wide and there is foul ground near the middle.

Wilson Patch lies in the center of the western end of Wawa Channel. It is composed of sand and coral, about 150 yards in extent, and has a least depth of 8 fathoms at low water. From it Turtle Island bears 77° , distant 1.1 miles.

Tidal streams.—The tidal streams run strongly, the flood setting westward and the ebb eastward. In the narrow part of the pass off Ratua Island the ebb runs at springs from 5 to 6 knots, causing a very heavy rip with an easterly wind, extending right across the channel. The rip commences to the westward and gradually works to the eastward as the tide makes. The tidal streams make one or two hours after high and low water.

At neaps the stream is much affected by strong winds, and with a strong trade blowing there was little or no ebb stream for several days on one occasion.

At Port Lautour it is high water, full and change, at 6h. 11m.; springs rise 4 feet.

Directions—Leading mark.—A very good mark for entering Malo Pass from the eastward is with the left extreme of the lowest fall of Araki Island in line with the right extreme of Malo Island bearing 266° , view on plan. This leads to the anchorage eastward of Su chun Lagre Island, and in the fairway between that island and Guichen Reef, the narrowest part of the strait. When the western end of Ratua Island is 3 points abaft the beam, alter course as requisite to pass through the strait southward of Turtle Island, or to the northward if bound to Port Lautour.

It is not advisable to enter against the strength of the tidal stream at springs, as a vessel would have difficulty in keeping on the leading mark owing to the violence of the stream and the numerous swirls.

Aore Island is an upraised coral plateau about 400 feet high, densely wooded, and about 5 miles in diameter. It is only thinly populated.

The east coast of Aore Island is broken up into two bays about $1\frac{1}{2}$ miles deep, with uneven bottom and encumbered with patches of reef and foul ground, affording no shelter or anchorage that could be recommended.

Tu Tu Ba Island, about $3\frac{1}{2}$ miles long north and south by $1\frac{1}{4}$ miles wide, is of upraised coral, 240 feet high at its southern extremity, and densely wooded. There are several small villages scattered about and the natives appear friendly (1892). It is surrounded by a narrow fringing reef about 200 yards wide, except just at the southwest point, where there is a sandy spit, which is steep-to. The wreck of the steamer *Nambare*, with two masts and a funnel still standing in July, 1905, lies on the east coast of Tu Tu Ba Island in latitude $15^{\circ} 34' 45''$, longitude $167^{\circ} 17' E$. This ship went ashore August 25, 1902.

Anchorage.—There is anchorage for one small vessel in 17 fathoms sand off the sandy spit at the southwest part of the island protected from easterly winds, with right extreme of the high-water line of sand spit in line with the right extreme of Tu Tu Ba Island bearing 150° and the right extreme of Bogecio Island 229° .

Between the southwest point of Tu Tu Ba Island and the east point of Aore Island is a channel $1\frac{1}{2}$ miles wide, in the center of which is Bogacio Island, 110 feet high and about $\frac{1}{2}$ mile in diameter, on either side of which is a clear and deep passage.

Pekoa or Second Channel, between Aore Island and the mainland of Santo Island, is about 9 miles long and from $\frac{1}{2}$ to 1 mile broad. It is a useful deep-water channel and much used by steamers. There is good anchorage in this channel, where a vessel might safely

ride out a hurricane. The shore on either side is low and mostly steep-to, with the trees growing into the water.

The northern entrance is about 1,800 yards wide. From here the channel runs nearly west for 3 miles to the entrance of the Sarakata River on the Santo side. Both shores are steep-to, with a narrow fringing reef not more than 100 yards wide. Off the entrance to the river a sandy spit, mostly dry at low water, with several coral heads at its outer edge, extends for about 500 yards from the shore, forming the bar of the river.

Anchorage.—There is very good anchorage in Luganville Bay, on the south side of Clemenceau Point, in 9 to 10 fathoms, sand and mud, 400 yards from the shore. In the southwest corner of the bay there is a small patch of reef 200 yards from the shore.

Sarakata River.—On the bar, which is marked by a stake, there is a depth of 3 feet at low water. The river is about 20 yards wide, and is navigable for boats for $2\frac{1}{2}$ miles, with depths of from 6 to 12 feet. At $1\frac{1}{2}$ miles from the mouth is Luganville, a station of the French New Hebrides Co. Coffee, maize, yams, taro, etc., are grown; difficulty is, however, experienced in getting sufficient labor. The mouth of the river is an excellent place for hauling the seine. From the mouth of Sarakata River the channel turns southwest and gradually narrows to a width of 1,000 yards opposite Belchiff Point, at the mouth of the Renee River, distant 3 miles from the Sarakata River.

Renee River.—A shingle spit extends from the points on either side of the entrance for 150 yards.

The river is navigable by boat for about 1 mile, with depths of from 4 to 9 feet, but there are many snags; it then becomes a narrow torrent between high coral walls, forming some very beautiful scenery. No natives or signs of paths were seen up the river. There is a village among the trees near the beach, about 1 mile northwest of Belchiff Point.

Good anchorage may be found northward of Renee River by steering in with a single conspicuous palm on the slope of 400-foot hill, bearing 263° until Belchiff Point bears 212° . Anchoring in 16 fathoms, excellent holding ground of yellow mud will be found.

Dart anchorage.—There is very good anchorage southwest of Belchiff Point in from 10 to 12 fathoms, sand, 300 yards from the shore with Belchiff Point bearing 52° , distant 700 yards.

Directions.—From the northward after passing Renee River vessels should edge over to the southern shore, which is quite steep-to, to avoid the reefs fronting the shore northward of Brigstocke Point and reducing the navigable channel to a width of 800 yards. When about $\frac{1}{2}$ mile southward of the conspicuous tree on the southern shore steer to bring the northwestern extreme of Aore in line with the coast

at the conspicuous tree, bearing 41° astern, which mark leads in the fairway between Richards Point and Brigstocke Point Reefs. About 200 yards southward of the north extreme of the reefs is a small black rock on the reefs, awash at high water, which may be a good mark when the light is bad. These reefs extend southward for about 1,800 yards, and there is a small sandy islet 3 feet high with a few bushes on it about the middle of the reefs.

Caution.—There is apparently anchorage between the northern horn of the reefs and the Santo shore, but on no account should a vessel attempt to use it, as the tide in here was found to set strongly across the reef.

Brigstocke Point is 800 yards southwest of the above-mentioned reef, forming the southeast point of Santo. Off this point is a patch of reef extending about 400 yards from the shore, and there is foul ground outside it for another 300 yards.

On the Aore side there is a narrow fringing reef 100 yards wide and south of Richards Point the reef extends southward for 600 yards. The extremes of Aore Island kept in line bearing 41° clears the foul ground off Brigstocke Point, as above stated.

Tidal streams.—The flood runs to the southward and the ebb northward from 1 to 2 knots in the main part of the channel and from 3 to 4 knots through the southern entrance between Brigstocke and Richards Points Reefs at springs. The stream makes about one to two hours after high and low water.

It is high water, full and change, at Clemenceau Point in Luganville Bay at 5h. 46m.; springs rise 4 feet 9 inches.

South coast of Santo Island.—Close westward of Brigstocke Point is a narrow passage, navigable for boats at high water, leading into a shallow lagoon, where there are a few huts and natives. From Brigstocke Point westward the coast is rocky and much broken up, with several small islets. It should be given a berth of at least $\frac{1}{2}$ mile, as the bottom is very uneven and there are several patches of foul ground. Out in the channel the water is deep over to the Malo shore.

Baldwin Cove.—At 3 miles westward of Brigstocke Point the shore trends back for $1\frac{1}{2}$ miles, forming Baldwin Cove, with numerous small islets and coral patches. It affords anchorage in several places.

Carlo Islet is a very conspicuous little islet by reason of its white sandy beach. It is about 60 feet high, covered with bushes, and lies on the west side of the broad entrance to the cove. It is surrounded by reef from 50 to 100 yards wide.

Tangice Island, on which are two conspicuous clumps 140 feet high, and Sawers Islet lie northwestward of Carlo Islet. There are narrow passages between them.

Venui Island, on the east side of the cove, has a conspicuous tree 135 feet high on its western side.

Marescaux Ridge is a sunken barrier of coral with uneven patches of from 3 to 5 fathoms on it stretching across the broad entrance between Carlo and Venui Islands.

Richards Reef, about 70 yards in extent, dries 3 feet at low water. It is situated in the center of the cove 800 yards 35° from Carlo Island.

Directions.—Vessels should enter by Eastern Passage, between Venui Island and the mainland; it is 250 yards wide and free from any known dangers.

The anchorage recommended is 300 yards westward of Andrews Point in 10 fathoms, sand and coral. Anchorage might also be obtained in many other portions of the cove with the assistance of the chart and a good light, but caution is necessary, as the growth of coral here is extremely luxuriant and more coral heads may exist than are already shown on the plan, which was made during very dull weather when the light was extremely unfavorable for picking up shoal spots.

Behind Baldwin Cove is a remarkable flat-topped hill 860 feet high, similar in appearance to Araki Island.

Offlying Islands.—**Ulilapa Island**, a low wooded island, about $\frac{3}{4}$ mile long east and west and $\frac{1}{4}$ mile wide, 135 feet high, lies about 1 mile off the coast abreast Baldwin Cove, above described. There is a small lagoon on the north side, with mangroves.

Tubana Island is a similar small island, 110 feet high, about 400 yards in extent, lying 700 yards off the western end of Ulilapa Island. Both these islands are uninhabited.

There is a deep-water channel 1,800 yards wide between them and Carlo Island, Baldwin Cove.

Dawson Reef is a detached patch of reef about 500 yards in extent, having 4 to 5 feet at low water and lying 900 yards 232° from Sawers Island, west side of Baldwin Cove.

Clearing mark.—The right extreme of Tangoa Island in line with Front Hill, a conspicuous sharp summit 1,690 feet high, on one of the lower ranges 6 miles westward of Tangoa Island, bearing 292° leads 800 yards southward of Dawson Reef.

Tangoa Island, 1,400 yards long east and west by 600 yards wide, of upraised coral, 170 feet high, lies close to the shore 2 miles westward of Carlo Island. A conspicuous small pier and boathouse have been constructed on the north side of this island close eastward of Canoe Point.

Mission.—There is a station of the Presbyterian mission here. The native inhabitants are rapidly decreasing.

Anchorage.—There is an excellent anchorage on the north side of the island on either side of a sandy spit (Annand Point) according to the wind. This point has some huts on it, which are conspicuous when seen from the westward. The only drawback is that it is one of the few places in the group where the annoyance of mosquitos is experienced at night, probably owing to the low swampy land along the Santo shore. The best anchorage is westward of Annand Point, off Canoe Point, in 12 fathoms, sand and mud, with the west extreme of Tangoa bearing 223° and the east extreme of Tangoa 111° . Entering from the eastward be careful of the reef which extends 100 yards from the northeast point of the island. There is a small black rock on its outer edge, which dries 2 feet.


Landing can be effected on the beach on the east and west sides of Annand Point.

Maloku Islet, 900 yards westward of Annand Point, is a small islet 42 feet high, connected to the shore at low water. Outside its reef and foul ground extend nearly 200 yards.

Water.—There is a stream about 400 yards northeastward of Annand Point, where excellent water may be obtained at all times of tide.

Tide and tidal streams.—Day and night tidal observations were observed at Canoe Point, Tangoa Island, from July 11 to October 23, 1892. It is high water, full and change, at 6h. 19m.; springs rise 3 feet 9 inches; neaps rise 2 feet 11 inches; neaps range 2 feet.

Flood stream sets westward, ebb eastward, and begin from one to two hours after high and low water.

A bench mark  8 feet 2 inches above low-water springs or 6 feet 1 inch above mean sea level is cut on the nearest tree northwestward of the boat shed, and a corresponding mark is cut on the northwest corner of the boat shed.

Elia Island, 120 feet high, 200 yards in diameter, covered with trees, lies 1,200 yards southwestward of Tangoa Island, the channel between being deep.

Araki, or Hat Island, about 1 mile in diameter, is a very remarkable flat-topped island, 3 miles southwest of Tangoa Island. It rises in distinct steps of coral limestone cliffs to a height of 830 feet. The southwest side is precipitous. It is a good object coming up from the southward, nearly always showing up well against the land, and like a flat-brimmed hat in appearance. The water is deep all around. It is inhabited.

The coast.—The beach westward of Annand Point is of black volcanic sand for about 1 mile, to the entrance of a small river, and then of sand and shingle, with several small streams and rivers running out through it for 5 miles to Powell Point, on the north side of

which is a little bay with a small islet close to the shore, behind which is a station belonging to the English New Hibrides Co.

Powell Point is steep and rocky, with a small bare rocky islet 25 feet high (Taviata) lying 600 yards off the point; the water is deep around. Westward of Powell Point is a bay with a beach of large pebbles, nearly 2 miles long; two considerable rapid streams find their way out over the beach. Landing as a rule can only be effected at the eastern end of the beach.

South Cape.—The coast now trends southward for 2 miles and then turns westward, forming the South Cape of the island, for 5 miles, to a point which has a reef extending off it 200 yards; it then turns north for 1½ miles to Cape Lisburne. It is steep-to and apparently clear of all offlying dangers all the way.

Nub Hill, which is in latitude 15° 38' 55" S., longitude 166° 48' 31" E., 855 feet high, overlooks South Cape and is a prominent object from the southeastward.

Lisburne anchorage.—Cape Lisburne is a rocky cape with coral cliffs about 90 feet high covered with scrubs. One mile 167° of the cape are the villages of the small tribe Wa Wa, whose people are friendly. The anchorage for small vessels is in 7 fathoms 1,350 yards 43° of Cape Lisburne. Large vessels must anchor farther out. There is very good shelter from easterly winds.

A conspicuous object from the Lisburne anchorage is Murder Rock, distant 3½ miles to the northward. It marks the south extreme of Kuavanuji Bay.

With all strong winds, no matter from what direction, a heavy swell sets in from south to southwest on the south coast of Santo Island, causing a considerable surf on the various beaches and rendering landing difficult except at a few places.

Water may be obtained here from a stream which runs down from the hills, but few supplies are procurable.

West coast of Espiritu Santo northward of Cape Lisburne is abrupt, rising in perpendicular cliffs from the sea. It is intersected by numerous ravines and is of irregular outline, rising in numerous peaks of from 1,000 to 3,000 feet in height, increasing in altitude as the center of the island is approached. The hillsides are scored by watercourses and many of the mountain spurs are destitute of trees, but the north and south sides of the ranges, as well as the valleys, are densely wooded.

A shoal has been reported by the British naval vessel *Phæbe* in approximate latitude 15° 23' 30" S., longitude 166° 34' 00" E. The sea was breaking slightly on this shoal, which was about 600 yards in extent, east and west, and 300 yards wide, and on which the least depth obtained was 3 fathoms.

As this position is only 4 miles from that of a shoal reported by the British naval vessel *Conflict*, it has been placed on the chart in the above position. A shoal is charted about a mile offshore abreast it.

A shoal lies southwest from Pallier off the Nogugu mission station. The British naval vessel *Wallaroo* sounded on this shoal and found $3\frac{1}{2}$ fathoms on it and shoal ground inshore of it. From the shoal the mission house bears 54° , about 2 miles. The best anchorage is to the northward of this shoal, with the mission house 88° and Pillar Rock, at the south end of the bay, 144° .

Landmark.—A conspicuous black cliff with a white patch is situated about 2 miles southward of Nogugu.

A large white house is erected northward of this cliff.

Anchorage.—The following anchorages have been pointed out, but further information on each is very desirable: Pussei, latitude $15^\circ 24'$ S.; Tassmatta, $15^\circ 22'$ S.; Veirei, $15^\circ 12'$ S.; and Pallier, $14^\circ 55'$ S.

At three miles southwestward of Cape Cumberland, in about latitude $14^\circ 41'$ S., there is a small indentation in the coast line named Vairai, where the coasting vessels anchor. It possesses a good watering place.

Pallier.—Vessels can anchor in a depth of 7 fathoms at about 300 yards from the shore and about 1 mile north by east of Nogugu mission station, with the church bearing 133° .

Cape Cumberland, which forms the north point of Espiritu Santo, extends from the high land of the island in a low tongue for about 2 miles before terminating in the sea. Not far from this point are to be seen the ruins of buildings of considerable size, pillars of regular shape and fragments of masonry being scattered over a plain about 3 miles in extent; and at a village 5 miles distant from the cape are similar remains, of which the natives appear profoundly ignorant.

On this part of the coast the plantations are carefully made and fenced, and the ground shows repeated signs of clearing.

Wora Bay.—Temporary anchorage during offshore winds may be found in this bay, situated 14 miles southeastward of Cape Cumberland, in a depth of 40 fathoms, at $\frac{1}{4}$ mile from the shore.

Vessels should steer in with a red patch on a hill bearing 200° . The only landing place is opposite the huts in the southern corner of the bay.

A conspicuous green patch is situated $5\frac{1}{2}$ miles southward of Wora.

St. Philip and St. James Bay.—This bay is locally known as Big Bay. The western shores of this bay (so named by Quiros) are of volcanic formation, and consist of high ridges of mountains, increasing in altitude from 1,000 to 4,000 feet as the center of the island is approached. At the head of the bay the hills form a plateau

or table-land, about 800 feet in height, which decreases in successive steps as Cape Quiros, which is of coral formation (terminating the eastern shores of the bay), is arrived at.

At the head of St. Philip Bay the water is deep, irregular depths of from 20 to 30 fathoms being found at a distance of about 400 yards from the beach, except immediately off the mouth of the Jordan River, from which a spit extends, having upon it 5 fathoms of water at 200 yards distant, quickly deepening to 17 fathoms at 300 yards.

Around the shores of the bay there are several patches and from its southwest angle they extend some distance offshore. Some little difficulty is experienced by sailing vessels making for the anchorage on account of the prevalence of calms in the bay. The ordinary trade wind comes beautifully fresh and cool over the land, while the temperature is about 4° lower than in other parts of the group, and occasional sea breezes from northward contend with the trade winds.

Terebiu mission station, off which there is good anchorage, is situated $1\frac{1}{2}$ miles southward of Ajuga Point. There are white spots on the coast $1\frac{1}{2}$ and $2\frac{1}{2}$ miles, respectively, southward of Terebiu.

Table Peak, 1,200 feet, at the head of the bay, is hat shaped, and on its northwest face is a white patch of apparently old coral rock, which shows out from among the foliage to a great distance when the sun shines upon it. A conspicuous hill similar in shape to Table Peak is situated westward of it.

De la Table anchorage, on the southeast side of St. Philip Bay, has depths of 9 to 11 fathoms, over good holding ground, with a remarkable white patch on the eastern side of Table Peak bearing 169° and the mouth of a rivulet 147° . That rivulet affords a good watering place, but there is a little surf on the beach.

Jordan River.—This Jordan River (named by Quiros) flows into the head of the bay and has a shifting bar. There is anchorage off this river in 10 fathoms, sand, about 670 yards from the beach, with the mouth of the river in line with the right fall of Table Peak bearing 130° , but the space over which this depth is found is confined, and a vessel may be quickly set off it into deeper water. When approaching from the westward the entrance to the Jordan River can be seen only from the masthead. This river is reported to be teeming with fish; duck also may be obtained.

A shoal of $2\frac{1}{2}$ fathoms, doubtful, is charted about $1\frac{1}{2}$ miles off Jordan River.

A large patch of discolored water was observed by the British naval vessel *Prometheus* in 1909, in a position $1\frac{1}{2}$ miles westward of Jordan River, at $\frac{3}{4}$ mile from the shore.

Water.—This is a convenient place for watering, as the boats pull into the river, where any quantity of good fresh water may be pro-

cured. It is at times inaccessible for large boats, but by leading a hose to the river, over the beach, water could in moderate weather always be obtained.

Supplies.—A few pigs and yams are to be procured here, and drift wood may generally be found on the beach. The natives are friendly.

Talomako anchorage is in the southwest corner, near the head of St. Philip Bay; there is a depth of 12 fathoms over sandy bottom, with Cape Quiros bearing 37° , Table Peak 113° . The bed of soundings suitable for anchorage is very small and terminates abruptly.

Cape Quiros, the northeast point of Espiritu Santo Island, is low, covered with coconut trees, about 80 feet high, and extends about 3 miles before it increases in elevation.

Sakau Island, off Cape Quiros, has an abrupt cliff on its north side, but a low point apparently extending from the bluff to the southward. The island is covered with coconut trees, and the channel between it and the shore is deep, but it is subject to strong eddies.

Rocks covered by 6 to 9 feet have been reported to exist about $1\frac{1}{2}$ miles northward of Dolphin Island.

Port Olry.—Dolphin Island, 680 feet, which incloses this anchorage, appears in some directions in the form of a table, but when seen from the southward the profile resembles a dolphin's head. A reef extends off the north end of the island a short distance, and a blank with 7 fathoms over it lies 150 yards westward from the same point. The northern islet in Port Olry is rocky and wooded, the height to the top of the trees being about 30 feet.

The islet southeastward of the mission station is thickly wooded, and about 130 feet high to the tops of the trees.

Two fresh-water lakes are situated on the southwestern side of Dolphin Island.

There is anchorage with the south point of Sakau covered by the north end of Dolphin Island, the point of entrance on the mainland side bearing 350° .

The southern entrance of the port is barred by a line of rocks, and which extend across the southwest angle of the port, inclosing a clear space 700 yards in each direction, which affords good anchorage in 8 to 10 fathoms, bottom sand and mud. By buoying a channel across the bar, vessels of 15 or 16 feet draft could anchor in the creek in the southwest part of the port (there seems no advantage in going there).

Coast—Elephant Island.—The coast to the southward of Port Olry forms a deep bay, which is inclosed on the east side by an island, 660 feet, in the form of a hat, except when seen from the southeast, when it assumes the form of an elephant's head with the

trunk elongated horizontally. Anderson Reef P. D. is charted about 2 miles 302° of Elephant Island.

Leke Bay.—This small bay is situated westward of the north end of Elephant Island. There is only sufficient space for small vessels, as the east and inner sides are bordered by heads of coral. The anchorage is in 11 fathoms; bad holding ground.

Between Port Olry and Leke Bay the land should not be approached within 2 miles.

Hog Harbor or Lonock Bay, about 1,200 yards in extent, lies 2½ miles southward of Elephant Island. Shallow water extends about 400 yards from its head, and Moror Reef lies 400 yards off Moror Point, the eastern extreme of the bay, and about 1,200 yards eastward of the mission station, situated on the west side of the bay.

Landmark.—Two conspicuous trees are situated about 1½ miles northward of the mission station. The western of these, kept just open southward of the eastern, leads through the eastern entrance.

The shore at the head of the harbor is well planted with coconut trees.

Supplies.—Fresh beef can be obtained.

Anchorage.—There is well-sheltered anchorage in about 14 fathoms between Moror Reef and the mission station, with the latter bearing about 268° and 600 yards from the shore, with the beacons below mentioned in line. A light is exhibited on Farquhar Point when a vessel is either expected or is leaving. A white flagstaff stands in front of the mission station.

Coast.—**Requin Bay or Shark Bay** is inclosed by Pilot (Litharo) Island, which is moderately high. The depth at the anchorage is 16 fathoms, irregular bottom, with bad holding ground. There is a rivulet at the head of the bay. At 1 mile to the southeastward of Pilot Island is Pilotin (Litharoa) Island, with a passage between it and Santo.

Turtle Bay.—**Mafia (Mavire) Island** is about 5½ miles southward of Requin Bay. Its northern end is prolonged by a reef, on which stands a low islet named Turtle Islet. The passage north of it leads into Turtle Bay, which affords anchorage in about 10 fathoms. Caution should be observed when entering, as it has not been examined in detail.

Undine Passage, between Mafia and Aessi (Haiite) Island, is clear, and the coast of Santo is steep-to.

There is apparently quiet water within these islands.

Pallikulo Bay is formed by a considerable recession in the coast immediately to the westward of Pallikulo Island, at the southeast end of Santo Island, and may be entered by Diamond Passage, which is apparently deep and free from danger. A reef which uncovers

connects the point of the mainland with the island, within which there is shelter against easterly and southeastly winds. The bay is partially covered with beds of coral, which appear to have sufficient water over them, but great caution is necessary.

Anchorage may be taken in 17 fathoms, with the extremes of Pallikulo Island bearing 49° and 116° . A patch of $3\frac{1}{4}$ fathoms is charted 600 yards southward of this position; others may exist, as the plan is but a sketch.

CHAPTER X.

BANKS, TORRES, AND SANTA CRUZ ISLANDS, ETC.

The Banks Islands—General remarks.—Banks Islands, a volcanic group lying to the northward of the New Hebrides, were discovered in 1789, comprise the islands of Gaua (Santa Maria Island), Vanua Lava, Ureparapara (Bligh Island), Valua (Saddle Island), Mota (Sugarloaf Island), Meralav (Star Peak Island), Merig, Rowa, and Vatganai. The first two islands, the largest of the group, contain about 100 and 105 square miles respectively, and the last three are merely small islets.

The heights of the larger islands vary from 3,000 to 1,400 feet, Mota and Meralav rising straight up from considerable depths to well-defined symmetrical cones 1,350 to 2,900 feet high, respectively. Ureparapara is simply the unsubmerged portion of a large crater with the eastern face blown out, and forming a fine harbor therein, the hills surrounding it presenting a somewhat serrated outline, with the summit on the west side, and gradually sloping to the eastward. Vanua Lava, Gaua, and Ureparapara still exhibits signs of latent activity in the form of fumaroles and sulphur springs. Meralav has long been inactive as a volcano, and Mota exhibits distinct signs of upheaval, the volcanic portion of the island resting on a base of madrepore.

Harbors.—With the exception of the harbor in Ureparapara and Port Patteson in Vanua Lava there are no harbors in the group. Landing on the south and southeast sides of the islands is usually impracticable, but on the lee side it can be effected without risk. Earthquakes are frequent, the usual direction being from north to south; but no great damage is recorded.

Water.—The large islands are well watered, but in the smaller ones there are but few springs, and water is somewhat scarce during the dry season. But as even then rain usually falls about once a week, the want of springs is not a very serious drawback.

The Melanesian mission has been established in this group for years, and its influence is largely felt. Mission stations are distributed at intervals along the coasts of nearly all the islands, the headquarters being at Mota.

Winds.—The winds about Banks Islands are governed by the same laws as at New Hebrides, only that the hurricanes which are experienced in the southern part of the latter archipelago are seldom felt in the former.

Currents.—The currents between Banks Islands appear to be affected by the wind, their rate being from $\frac{1}{2}$ knot to 1 knot, according to the force of the wind.

Meralav or Star Peak Island, the southeastern island of the group, rises to a conical-shaped peak, 2,900 feet high, bearing evidence of its having been at one time an active volcano. The island is steep-to around, except off the northeast point, where there is a small offlying rock; and, though small, it contains (1886) a population of about 300, cultivation extending some distance up the mountain side. At the northeast point there is a small beach where landing may be effected. The natives possess some very small canoes. A few yams may be procured.

There is said to be temporary and indifferent anchorage for a small vessel on its lee side.

There is a mission station on this island.

Gaua (Gog) Island or Santa Maria is nearly circular in shape, about 10 miles in diameter, 2,300 feet high, flat topped, thickly wooded, and cultivated. The northeast end is low, the slopes to the eastward being gradual. Gaua is more thickly inhabited than any other island of the group. Many of its people are acquainted with English. Mission stations are established at several places along the coast. The French New Hebrides Co. possesses a large tract of land here.

The northwest point of Gaua is a very high steep cliff. From that point to the southwest end of the island, which is also a steep cliff, there are some detached reefs at more than $1\frac{1}{2}$ miles from the shore. The northeast coast is bordered by a reef which extends $\frac{3}{4}$ mile from the shore, in which there are three openings, each affording an anchorage for small vessels during fine weather. Off the northeast, north, and west sides there are some small islands.

At the point extending from the hill at the southwest end of the island a belt of reefs extends across a small bay as far as Olimbu Point, which is the south extremity of the southwest end of the island. Thence to the eastward the coast is steep-to for a distance of 4 miles to Tufted Point, off which a reef extends $\frac{1}{2}$ mile; another reef borders the southeast coast and appears to extend along the whole eastern side of the island.

Caution must be exercised when approaching the east or northeast sides of Gaua at night, as the low land projecting in front of the mountains renders the estimation of distance difficult.

Landing on the southern and eastern sides is difficult; but at the various little coves it is good, the fringing reef, through which there are boat passages, breaking the swell.

Supplies.—Fruit, vegetables, fowls, and pigs are plentiful and are readily bartered for tobacco. The lake on the eastern side of the island abounds with ducks and eels. There are sulphur springs in the vicinity.

Lakona Bay, on the southwest coast, is $\frac{3}{4}$ mile deep, with two sandy beaches; it affords anchorage in 10 fathoms, black sand, at $\frac{1}{4}$ mile from the shore and $\frac{1}{2}$ mile southward of a conspicuous waterfall situated in the northern part of the bay. There is a village here, but it is not visible from seaward. Pigeons may be shot here and water can be obtained at the mouth of the small river which enters the bay.

Reefs.—A shoal with a depth of 3 fathoms on the northern part and 1 mile long in a northeast and southwest direction, within the 5-fathom curve, is situated about $2\frac{1}{4}$ miles westward of Lakona Bay, in a position from which (approximately) the southwest extreme of Gaua Island bears 150° , distant $2\frac{3}{4}$ miles.

A reef awash is situated about 2 miles southward of the above shoal, with the southwest point of Gaua Island (approximately) bearing 108° , distant $2\frac{1}{2}$ miles.

Anchorage can be obtained in a depth of 14 fathoms in the bay northward of Lakona Bay, off the mission station, at about $\frac{1}{2}$ mile from the fringing reef, which extends from White Rock Point to the south point of this bay.

At high water boats can cross this reef at any part, but at low water there is only a narrow channel.

White Rock Point in a line with Steep Bluff 35° will, it is said, lead eastward of them; but caution is necessary, as the positions of the dangers are uncertain.

Masevonu, on the northwest side of Gaua, affords good anchorage in 12 fathoms, 200 yards from the edge of the reef, during southeast winds, the reef giving protection. The anchorage may be recognized by a large house, which shows well just to the eastward.

Losalay, on the north end of the island, is the largest of the breaks in the reef, and its entrance is readily seen by a passing vessel.

A steamer could easily obtain anchorage in the outer part of the break in from 8 to 13 fathoms or, if occasion required, go farther in and anchor in 5 or 6 fathoms, sand, within a few hundred yards of the shore. The course in is about 212° .

At the distance of 1 mile to the westward a small red rock serves to identify the position until near the reef, when, with the sun in a favorable position, the eye must be the only guide.

A little to the westward of the red rock (before mentioned) there is a small wooded hill close to the coast, and $\frac{1}{2}$ mile beyond the hill the reef contracts, leaving deep water close to the shore.

In entering it is necessary to keep close to the reef on the eastern side of the entrance to avoid two coral heads outlying in the center of the western reef. Patches outlie the reef farther in, as shown on the plan.

Caution is necessary and a good light, in order to avoid any coral head not marked on the chart.

It may be necessary to lay out a kedge, as there is not much swinging room. Water or other supplies unobtainable. Natives number about 350 and were friendly.

Vir or Avire.—A little to the eastward of Losalav there is an opening about 70 yards broad, leading into a small but well-sheltered anchorage off the village; but the place is only available for small vessels, which, with steady winds, might fetch in. The leading mark was a large tree at the landing place in line with a pinnacle in the mountains bearing 226° .

Tarasag, on the east side of the island, is said to be larger than Vir, but it has the disadvantage of having no land to shelter it to windward.

Between Vir and Tarasag there is discolored water at $\frac{1}{4}$ to $\frac{1}{2}$ mile from the reef, with 7 to 10 fathoms, rocky bottom.

Water.—On the eastern side of the island, on a plateau 400 or 500 feet high, is a large lake, from which a waterfall descending is conspicuous from seaward, and useful for watering.

The lake is about 18 miles in circumference, and has a bottom of hard black sand. There are some sulphur springs at the west side of the hills, forming the lake basin, and fumaroles and solfataras within the encircling ridge.

East Point.—To the southward of East Point there is an opening in the reef about 60 yards wide, leading to a small craft anchorage. At the inner part there are many shoals. Small vessels seeking shelter there should anchor immediately on reaching 5 fathoms.

Merig or St. Claire is a small islet, about 200 feet high, situated nearly midway between Meralav and Gaua Islands, and having a population of about 30.

There is no anchorage at Merig, and the landing is bad. Water is scarce.

Vanua Lava—General remarks.—Vanua Lava, the largest island of the Banks Group, is 15 miles long north and south and 10 miles broad. A volcanic mountain range, attaining a height of upward of 3,000 feet, runs nearly throughout its whole length. The summit of the range (Mount Suretamati) is a crater, frequently emitting volumes of steam. On the northeast side, near the coast.

there are two remarkable and well-defined conical peaks, the northern being 2,620 feet high and the southern 2,530 feet high. The south-east extreme of this mountain range terminates in a conspicuous rounded peak, 3,120 feet high, and is the highest point of the range from which spurs descend to form a coast ridge along the southeast shore. A lofty promontory, rising to a peak 2,650 feet high, forms the southern extremity of the island, to which it is joined by a low and narrow neck of land.

The eastern side of this mountain range slopes steeply, with deep ravines, leaving a considerable area of low swampy land between the coast and the foot of the hills. On the north and west sides the slopes are more gradual, with a plateau 700 or 800 feet high, falling steeply to the shore. It is everywhere thickly wooded. The coast is throughout rocky, with small bays; black volcanic sand at the mouth of the larger ravines, or else beaches of coralline débris.

On the sides of Suretamati there are several hot springs, from which arise constant jets of steam. A stream of water impregnated with sulphur discharges on the northwest coast, while a similar stream falls into Port Patteson on the east coast. There are also two cascades on the west coast—one single, the other double.

Villages.—Vanua Lava is thickly populated. The principal villages are on the northwest side. On the northeast and east coasts there are but a few villages.

Missions.—There are mission stations at Pak, on the northwest coast, and at Avreas Bay.

Bank.—A bark in 1900 anchored during a calm in 9 fathoms, with the summit of Paut Point, the south extreme of Vanua Lava, bearing 99° , distant 42 miles.

Ravenga Island, situated $2\frac{1}{2}$ miles northward of Port Patteson, is small and wooded, and about 70 feet high, with a few inhabitants. It stands on a coral reef which, on the northeast and south sides, extends 400 or 600 yards from the shore. Foul ground is reported to exist to the eastward of this island, and that in strong easterly winds the sea has been seen to break to a distance of over 1 mile from the shore. It is separated from the main island by a passage $\frac{1}{2}$ mile in width with 5 fathoms water in it. The British naval vessel *Phæbe* reported this channel to be clear of danger from information received.

Shoal water appears to extend off the north end of Ravenga Island for nearly $\frac{3}{4}$ mile, the soundings suddenly shoaling from 35 fathoms to 14 fathoms, and it appeared still shoaler a little nearer the island. A bank of 7 fathoms is situated 1 mile northeastward of this island.

Shoal.—Eastward of Ravenga there is shoal ground, the position of which has not yet been ascertained, but by keeping on the Valur Island side of the channel it may be avoided; 2 fathoms has been

found over it, and it is reported to lie 2 miles farther eastward than shown on the charts.

The shore reef extends 600 yards from the low point between Ravenga Island and Ashwell Bluff.

Ashwell Bluff, the north point of Port Patteson, is about 200 feet high and wooded, being connected by a very low land to the mainland. It shows in all directions as an island and is conspicuous.

Shoal.—A shoal of 4 fathoms, which breaks in bad weather, is reported to be situated about 4 miles northeastward of this bluff.

Port Patteson, on the east side of the islands, is over 2 miles wide, between the two promontories whose salient points, Grange and Nusa, partially inclose and protect two bays.

Meatlu Reef, which lies $\frac{3}{4}$ mile to the southwest of Nusa Point, divides Port Patteson into two unequal parts, named Nawona and South Bay. Within Meatlu Reef there is a shallow boat passage. To keep seaward of that reef the southwest end of Kakea Island should only be allowed to touch South Head, or the eastern extremity of the peninsula bearing 141° . The west point of Saddle Island well open of Ashwell Bluff, bearing 29° , also leads seaward of it.

South Bay, the southern portion of Port Patteson, is comprised between Spout Point on the west side and Grange Point on the east. The southeast side of the bay is formed by a peninsula which is a spur from a chain of mountains and presents three peaks, of which Point Grange is the least elevated. Surlava, $\frac{3}{4}$ mile to the southward, is 331 feet high. The third, Tawen-kwat, is $1\frac{1}{4}$ miles farther westward and bears 189° from the deep-water anchorage. All the shores of South Bay are bordered by a reef, which renders landing difficult except at the river. That part of Port Patteson which lies to the southward of Spout Point is composed of volcanic rock, while the northern part has a sandy beach.

The shore reef on the southern side of this bay is reported to have extended seaward.

Anchorage.—The anchorage in South Bay is moderately good, though open to the north and northeast. Vessels are also advised to anchor nearer to Grange Point than to the south or west shore. At the latter position a more convenient depth of water will be found.

Approaching the anchorage with Tawen-kwat 200° and anchoring in about 18 fathoms with Grange Point 88° has been recommended.

A reef which uncovers at low water is charted at 670 yards from the head of the bay.

Reefs are said to be more extensive than shown on chart.

A heavy southeast swell is frequent.

Tides.—It is high water, full and change, at Port Patteson at 6h. 40m.; springs rise 5 feet.

Water.—The rivulet Ghalau flows into the southwest angle of the bay and affords good water.

The name of the northern stream which discharges near Meatlu Reef is Rha-Puna (*warm water*). Water obtained after heavy rains soon became foul.

Dudley Channel lies between Port Patteson South Peninsula and Kakea Islands. Its entire width is about 1,800 yards, with a depth of 8 to 13 fathoms.

South Head should not be approached within 300 yards, as the sea has been observed to break on a reef which extends from that point. The British naval vessel *Phæbe* obtained soundings of 7 fathoms at 1,200 yards to the northeastward of South Head. Patches of $6\frac{1}{2}$ and 8 fathoms, observed by *Ringarooma* and *Royalist*, lie in the fairway as charted.

A rock of 4 fathoms, and possibly less, is situated in the northern entrance to this channel, from which Surlava Summit (331 feet) bears 237° , distant 1 mile.

This rock is situated near the shoal patches reported by the British naval vessels *Ringarooma* and *Phæbe*.

The reefs on the southeastern side of Dudley Channel, fringing Kakea and Niwula Islands, appear to extend farther to the northwestward than at present charted.

The tidal stream sets fairly through, the flood to the northward, the ebb to the southward.

Kakea and Niwula, east side of Dudley Channel, are low, flat-topped, wooded islets, encircled by a reef which extends from $\frac{1}{4}$ to $\frac{1}{2}$ mile off the northeast extremity of Niwula.

South coast.—On the southeast coast, 3 miles to the southwestward of Kakea, there is a small wooded islet 50 feet high nearly $\frac{1}{4}$ mile from the shore, to which it is connected by a reef. On the prolongation of the reef 400 yards from the islet is situated a rock a few feet above high water, and outside of which foul ground extends probably for about 400 yards farther.

Mosina Bay.—On the east side of the south end of Vanua Lava, abreast Avreas Bay, is Mosina Bay, a deep indentation, open to the southeast. There is anchorage at its head $\frac{1}{4}$ mile from the sandy beach, but during the greater part of the year it is exposed and unsuitable for a vessel to make use of.

The anchorage is opposite the village. The south point of the bay is fringed by a reef; the central part has a bottom of white and black sand. There is a small reef at the inner part of the bay which can be seen from the masthead.

Vessels experienced heavy squalls from the high land to the southward.

Avreas Bay, situated on the southwestern side of Vanua Lava, northward of the lofty promontory before alluded to, is about 3 miles long and 1 mile deep; it is known to the natives as Vureas Bay. It affords protection from all winds from north around to south-south-east, with anchorage in 10 to 15 fathoms, black sand, in any part of the bay, at about 600 yards from the shore.

Landmarks.—A house with galvanized-iron roof, situated on a hill above the black lava rocks, is conspicuous from seaward, but hidden from the anchorage by trees.

Southward of this house is a house with thatched roof. Cultivated ground extends northward of these houses.

Anchorage.—Good anchorage can be obtained in this bay in a depth of $9\frac{1}{2}$ fathoms, with the mission house, seen through an opening of the trees on the high land, bearing 57° .

Red cliffs—Shoals.—Shoal patches are reported to exist off the red cliffs and waterfall.

Natives.—The natives were considered more intelligent and finer looking people than those at New Hebrides. There is a school belonging to the English mission. Several natives can read and write; a few have a knowledge of arithmetic; several spoke English.

Supplies.—Yams, taro, and bananas were plentiful. Vegetables, fowls, and eggs may be obtained. Landing is fairly good. A few mackerel were caught with cast nets. No convenient watering place was seen.

West and north coasts—Anchorages.—On the northwest side of Vanua Lava there is good anchorage in 10 fathoms, sand, 600 yards from the shore, abreast a large village about $3\frac{1}{2}$ miles northeastward of the red cliffs (which are unmistakable) and $1\frac{1}{2}$ miles northeast of a deep valley that will be readily noticed.

Temporary anchorage may be obtained all along the northwest shore, the soundings nowhere deepening so suddenly as to preclude anchoring.

Mission.—There is a mission station at about a mile northward of the red cliffs.

Landing can usually be effected with ease in one of the sandy coves on the lee or west side of the island.

A patch of 3 fathoms lies about 1,200 yards 257° from the red cliff point on the northwest side of the island and bearing 296° from the waterfall, which is more than a $\frac{1}{2}$ mile to the southward of that point. It is of small extent and easily seen from aloft, and apparently has deep water all around. The British naval vessel *Phæbe* reports less than 3 fathoms on this patch.

Mota Island is situated 6 miles eastward of the southeast extreme of Vanua Lava. It has a conical peak 1,350 feet high, situated in

the center of the island, with a shoulder about 500 or 600 feet lower projecting to the westward, from which direction the peak takes the form of a symmetrical cone.

The coast line is bold and fringed by a narrow reef, making landing difficult. The best place is near the mission station on the northwest side, in a small indentation, which affords slight protection for the landing place.

There is no anchorage off this island. Small vessels occasionally lay out a kedge on the reef, and so ride for a short time.

Mission.—Mota numbers about 400 inhabitants and is the headquarters of the Melanesian mission in the Banks Group.

Supplies.—The island is fertile and produces fruits and vegetables in large quantities. The vegetation is everywhere luxuriant, but water is scarce. Pigs, fowls, fruits, and vegetables can easily be obtained, tobacco being the article of trade most in request.

Valua Island is situated about 8 miles northward of Mota Island. It is 6 miles long in a northeast and southwest direction, the northern portion being about 2 miles broad and rising to round hills 1,465 feet high. This portion of the island is named Valua.

The southern portion, named Mota Lava, is only 600 yards in width, the hilly portion terminating in a rocky bluff 965 feet high in the middle of it, leaving the southwest extremity quite low.

A fringing reef skirts the western side of the island projecting 400 or 600 yards from the southwest point, but it is steep-to and the edge easily seen.

The inhabitants number about 300 and are of the same type as those in the larger islands in the group. Most of the villages are near the coast.

The soil is productive, and on a plateau about 400 or 500 feet high, which exists along the south side of the hills, sugar and coffee have grown well. Cattle thrive on the island.

Water.—Valua is well watered with numerous springs, and a hose can be led into a boat from the stream discharging itself at the landing place in Milli Bay on the northwest side.

Milli Bay is an indentation affording precarious anchorage on the northwest coast, 1 mile to the southward of the northwest point. Approaching the bay with the mouth of the river about 128° , when the two points of the land to the northward come in line bearing 9° , and a mushroom-shaped rock on the reef $\frac{3}{4}$ mile to the southward of the anchorage is in line with the west extremes of Mota Lava, the anchor may be dropped in 20 fathoms, sand and coral, and thus give swinging room of 200 yards to the edge of the reef.

The landing is fairly good, the stream discharging itself here having formed a boat channel easily seen in the fringing reef.

The British naval vessel *Phæbe* in 1902 found there was no trader living at this place or in any part of Valua Island, and that there was no flagstaff standing.

Ara is a small wooded islet standing on the fringing reef which surrounds the southwest extreme of Valua Island, from which island it is distant 300 yards in a southeast direction. The reef which joins them is fordable. Ara contains about 85 inhabitants. Leprosy is not uncommon. Fruit, vegetables, and fowls can be obtained.

Reef islets, a dangerous reef, inclosing three small, low, sandy, wooded islets, lies about 4 miles northward of Vanua Lava, and is crescent shaped, with the concave side to leeward. The weather side dries to a considerable extent at low water, and is always marked by a break, but the lee side is calm and smooth, and therefore dangerous. It seems to be steep to around, excepting off the southwest end, where for about 200 yards there is broken ground with 10 fathoms, not suitable even for temporary anchorage. A shallow lagoon on the northwest side will admit a small trading vessel.

The three islands are on the north end of the reef. The southern island is the largest and terminates at the south end in a bank of sand. The tops of the trees are nearly 50 feet above the sea. The south extreme of Ureparapara bearing 267° leads northward of the reef.

The staple product is fish, which the natives spear and shoot and barter for vegetables and fruit from the other islands. Copra and beche-de-mer are to be obtained in small quantities.

Rowa Islet.—Only the northern islet, Rowa, is inhabited, the population being about 37 in number. There is a mission station on the island.

Sanna Islet.—Nearly a mile to the southward of Rowa Reef there is a small narrow island, of which no description has been received.

Directions.—To pass westward of the southwest prong of Rap Island Reef, Ashwell Bluff should be kept well open to the westward of Ravenga Island, bearing 155° . To pass southeast side of the reef, do not bring the northwest extreme of Vanua Lava to the southward of 237° .

Tides.—It is high water, full and change, at Rowa Island at 6h. 30m.; springs rise 6 feet.

Ureparapara or Bligh Island is situated 11 miles northwestward of Vanua Lava. It is nearly circular in shape, 12 miles in circumference, and is the unsubmerged portion of a large crater with the northeast lip blown out. This forms an excellent harbor, protected from the prevailing wind and sea, but open to the northeast.

The summit of the island, 2,440 feet in height, is on its western side, but is not a prominent peak from all sides. On the slope of this ridge the volcanic heat still finds a vent. The outline of the hills is somewhat serrated and slopes gradually to the eastward, the northern sides of the crater walls being higher than the southern.

Landing may be effected on the lee side of the island, near some villages, the inhabitants of which are friendly (1886).

Tide eddies have been observed off the southeast and southwest sides of the island.

Mission.—Ureparapara is well watered, and the eastern part of the island is fertile, but the western portion is not so much so, being more steep and rocky. Taro and considerable quantities of coconuts are grown. The shores of the bay are inhabited. The inhabitants, about 270 in number, are friendly. A station of the Melanesian mission is established here, and there is good landing.

Temporary anchorage.—The soundings around the island on the west and northwest sides shelve gradually, and temporary anchorage may be obtained in 18 to 25 fathoms under the lee, 30 to 35 fathoms being found at a distance of 1,200 yards from the shore.

Reefs.—A narrow belt of reef surrounds the island except at its northeast and southeast sides, but otherwise the coasts are steep-to.

Dives Bay is 2 miles in length by 1,350 yards in breadth, with a sandy beach at its head. Its entrance is perfectly straight and the approaches bold. The shores are fringed with reef with several detached patches and rocks at a distance of more than 200 yards from the shore on either side; but otherwise from the masthead it appeared clear of all dangers.

The mountain sides are thickly wooded and fall steeply down to the water's edge, except at the top of the bay, where they recede from the shore, leaving a margin of flat land.

The best berth seems to be in from 10 to 12 fathoms, sand, off a white sandy beach near the head of the bay, or nearer the southern side if necessary to be clear of any slight swell that might set in when the wind is from the eastward.

There is a reef awash at low water about 200 yards distant from the shore at the head of the bay. A prong of shoal water with rocky bottom appears to extend 77° of it, with a depth of 7 fathoms about 200 yards from the breaking part of the reef, and depths of 12 and 13 fathoms, sand and mud, on either side, deepening to 17 fathoms.

Turtle frequent this bay at certain seasons, and the seine may be hauled on the beach at its head.

Vatganai consists of two rocks, about 250 feet in height, situated 22 miles northeastward of Ureparapara Island, and forming the northernmost of the Banks Group.

The top is covered with trees. About 30 feet off the northeast point stands a perpendicular rock about 50 feet in height.

Torres Islands, also known as Vava, are five in number, between the parallels of $13^{\circ} 5' S.$ and $13^{\circ} 27' S.$, and the meridians of $166^{\circ} 33' E.$ and $166^{\circ} 43' E.$ They are of coral formation, some being flat topped, others rising in terraces to peaked hills. The North Island, of the latter description, attains a height of 1,251 feet, while the South Island is 901 feet. The Melanesian mission has established a station in this group.

Anchorage.—During the prevalence of the southeast trade wind anchorage can be found on the lee side of all these islands in about 20 fathoms at $\frac{1}{2}$ or $\frac{1}{4}$ mile from the shore; but it is recommended that a boat should be sent in first to pick out a sandy or mud bottom.

Tides.—The time of high water, full and change, at Picot Bay, Hiu Island, is 4h. approximate.

Hiu or North Island, the largest and highest of the group, is about $6\frac{1}{2}$ miles in length north and south by 3 miles in breadth. The southeast end is the highest, where the land rises to an elevation of 1,230 feet, sloping in terraces toward the northern point. Off the south point is a small spit or fringe of coral from which the land trends for about $2\frac{1}{2}$ miles northwestward, where there is a small bay and beach, the south extreme, Thomeuf Point, having a spit fronting it.

The village on the north part of the island is situated on a plateau about 300 feet high, the approach to which is very steep.

The natives appear (1872) indisposed to enter into relations with Europeans.

The points of the island are low and prolonged under water to as much as 300 yards. So it is well to give these points, especially those of the west coast, a good berth.

Buge Point, the northwest point of the island, is low with a spit extending a short distance off it; near it is a small spring of fresh water. For about 2 miles northwest of this point heavy overfalls with a short uneasy sea have been experienced.

Girandeau Reef, which generally breaks, extends nearly a mile off the north side of the island. A wide berth should be given to this extreme of the islands.

Picot Bay, on the northwest side of Hiu Island, affords tolerable anchorage in 16 fathoms 800 yards offshore. There is landing through a break in the reef on the northern side of Central Bay, but caution is necessary to avoid coral patches, for which see the plan. A path leads from this landing to the villages on the plateau.

Buge Point, the north point of this bay, is low; Doublet Point, the south point, is high, with a low wooded extremity.

Anchorage.—Vessels should anchor in a depth of 16 fathoms, with Buge Point bearing 347° , and a conspicuous patch of white sand on the beach bearing 99° .

Cosmao Passage is about $\frac{1}{2}$ mile wide and has a 2-fathom patch on its southeastern side at 400 yards from the north point of Metoma Island. Both sides of the channel have reefs fringing the shores as charted, reducing the navigable width to about 600 yards. Depths of 10 to 19 fathoms are shown in the fairway.

D'Hestreux Passage, between Metoma and Tegua, is only fit for boats. Patches of 3 and 5 fathoms are charted in its western approach.

Metoma or Ovale Island, between Hiu and Tegua Islands, is the smallest of the group, being $1\frac{1}{4}$ miles long by about $\frac{3}{4}$ mile broad and 412 feet high. It is separated from the above islands by the passage just described.

Tegua or Middle Island is about $3\frac{1}{2}$ miles in diameter, with a peak 643 feet in height. From Chovel Point, the south extreme of the island, the land trends northwestward and is bold for $1\frac{1}{2}$ miles, when it forms Hayter Bay.

Hayter Bay, on the west side of Tegua Island, has a snug anchorage in 16 fathoms, about $\frac{1}{2}$ mile from its head, partly protected by Ethel Reef in its approach. The reef at the head of this bay is reported to have extended to a distance of 670 yards offshore. The British naval vessel *Phæbe* found no boat passage in this reef, and landing could only be effected about high water. It is said the bay was raised some 5 feet by a seismic disturbance in 1897.

Landmark.—A conspicuous hut is situated 1,800 yards 122° of Pilot Point.

Reef.—The reef at the head of the bay is reported to have extended 200 yards seaward of its chartered edge.

Guichen Channel.—This channel is clear of dangers. The west extreme of Metoma Island just open westward of Pilot Point, bearing 359° , leads through Guichen Channel.

Ethel Reef is a detached reef 670 yards in length with a sand cay on it, separated from the south point of the bay by Guichen Channel. The British naval vessel *Basilisk* reported discolored water off its northwest extreme. A breaking patch is shown at 200 yards off the northern shore of the bay and probably other dangers exist. Guichen Channel, the southern entrance, is a $\frac{1}{4}$ mile wide, and has apparently 8 fathoms of water or more in the fairway.

Ethel Reef is marked by a few trees and bushes.

The British naval vessel *Archer* reported passing through it in 1903 and no dangers were found or seen from the masthead.

Scorff Bay is on the southeast side of the islands and has anchorage as charted and is said to be protected from the swell by the shore reef, and to be clear of danger up to the head which is fringed by a reef. It is open to the prevailing wind and probably of no use.

The depths in Scorff Bay are reported to be generally less than is shown on the plan.

Shoal.—About $1\frac{1}{2}$ miles off the northeast coast of Tegua Island, with the channel between that island and Metoma Island open, the British naval vessel *Basilisk* passed over several coral patches, on which 6 fathoms were found, but shoaler water may be expected. Between the east extreme of Scorff Bay, Dupond Point, and Loutel Point, the northeast extreme of the island, there is a fringing reef.

Grand Channel, $2\frac{1}{2}$ miles wide, separates Tegua from Lo Island and is apparently deep.

Lo (Saddle) Island, the latter name being owing to its formation, which causes it to make as two islands from the southwest, lies $2\frac{1}{2}$ miles southward of Tegua Island. This island is $3\frac{1}{2}$ miles long northwest and southeast and about 2 miles from east to west in its widest part. The south peak is the higher, being 390 feet, and the north peak about 351 feet above the sea.

The landing place was formerly at Log Bay, on the northeast or weather side of the island, but a better place for communication has been found about the middle of the north face, at a white beach with coconut trees opposite a saddle in the land. This place was named Boat Cove, as there was a narrow winding passage in for the boat.

Log Bay, about $\frac{1}{2}$ mile in length, has patches of white beach and a fringing reef on both sides of the entrance, but it gives no shelter from southeast winds. From the north shore reefs extend a short distance from all the points, with much surf on the beach. On the northwest side landing would not be difficult, as above mentioned. From the south and west sides of the island reefs fringe the points to a short distance.

Dumanoir Channel, between Lo or Saddle Island and Toga or South Island, is $2\frac{1}{2}$ miles wide and apparently deep; it has not been examined. A reef stretches from Le Pape Point, the south point of Saddle Island, the extent of which is not known.

Vi Paka, a bay on the west side of the island, affords anchorage in 18 fathoms at $\frac{1}{4}$ mile offshore. The best landing is at the southeast part of the bay, whence there is a path to the mission.

Toga or South Island, lying about 2 miles southeastward of Saddle Island, is flat topped, 896 feet high, and about 8 miles in circumference. It is steep and bluff in most places and is inhabited.

A reef extends 150 yards at least from the southeast point and fringes the other points and the coast of the island where not abruptly terminated by cliffs. The island has not been surveyed.

The best landing place is on the northwest coast, between Breneol Point and Merret Point, from which a native village can be approached.

Tucopia Island—General remarks.—This island was discovered by Quiros in 1606. It is under the protectorate of Great Britain, since January 28, 1899.

The island forms a triangle; the west side is about 2 miles in length, the south side similar, and from the east to the northwest point 3 miles. It is thickly wooded, and possesses a great number of coconut trees. When seen from west by south the north end presents a sharp peak about 1,235 feet high and covered with rich vegetation, while the south end terminates with a vertical cylindrical rock about 200 feet high, having a tuft of shrubs on the summit. The northeast end of the island is the highest; from thence it stretches regularly to the southwest.

The island, it is said, may be approached in safety on all sides. There is a narrow coral reef fringing the shore, upon which landing is not easy at all parts, as there are holes here and there which render walking difficult.

Tucopia has been described as appearing like an ancient volcano of which one of the sides had fallen into the sea, and by that opening landing may be effected. The interior of the crater is covered with beautiful vegetation. Near the center of the island there is a limpid lake, which the natives say is very deep. It probably occupies the place of the last eruption.

From the southwest point a reef plainly seen extends about 1 mile. From the northwest point the reef extends but a short distance. There is a sandy beach on the east and also on the west sides, where there are several neatly made huts. The island is well cultivated.

Ringdove anchorage, just northward of the southwest point of the island, affords shelter from the prevailing winds, between the reef fringing the southwest point and the 1 to 3 fathom patches on the north side of the anchorage.

A vessel can anchor with the point of the reef bearing 200° , and the northwest point of the island bearing 60° , and the conspicuous bluff bearing 102° , in 27 fathoms, 400 yards from the reef; bottom, coarse sand and shells. The depth increases considerably outside this position.

The plan shows a depth of 6 to 10 fathoms with the bluff bearing about 99° , and apparently a good mark to enter and anchor on in a small craft at about 150 yards from the reefs.

See view on plan of conspicuous bluff. Too much reliance must not be placed on this sketch plan.

The position of the conspicuous bluff at Ringdove anchorage, Tucopia, is latitude $12^{\circ} 16' S.$, longitude $168^{\circ} 48\frac{1}{2}' E.$ The anchorage is bad.

Inhabitants.—about 500 in number, belong to the same race as the natives of the Society and Friendly Groups; they are cheerful, confident, and truthful.

Supplies.—Breadfruit, yams, taro, coconuts, and bananas are produced on the island, and a small quantity may be procured. The sea will furnish fish and some shellfish, but there is no kind of meat on the island.

A very small supply of water was obtained from a spring in the rocks to the left of the southwest reef. It was also obtained from pools 1 mile from the beach.

Lagoon.—On the southeast side of the island there is a fresh-water lagoon 2 miles long and $1\frac{1}{2}$ miles wide, and the natives stated there were large fish in it.

Anuda or Cherry Island.—The extent of this island (which is in lat. $11^{\circ} 35' S.$, long. $169^{\circ} 50' E.$) in any direction does not appear more than $\frac{1}{2}$ mile. The hill rises at its north end, is 212 feet in height, and appears at a distance bare, but is well cultivated. The spurs of the hill slope down to a fertile and beautifully wooded valley, where the natives live in low, neat houses among the trees. The island is thickly covered with vegetation and has a fine sandy beach along its western side. It has been under the protectorate of Great Britain since January 28, 1899.

Anchorage.—There is anchorage in 14 fathoms, sand, with the north extreme of the island 65° , and Southeast Rock, 20 feet high, 133° , at about $\frac{1}{2}$ mile offshore. Open to all winds but northeast. A heavy swell sets in. Apparently, from the plan, there is anchorage much nearer the island.

Natives.—The natives are a fine race, superior in intellect to the natives of New Hebrides; they are fairer, have long, straight hair, and are pleasing in appearance, though all chew the betel nut. The average height of the men is about 5 feet 11 inches, and they are broad in proportion; none of them carried weapons of any kind. They have very neat canoes, in which they went off to the *Conflict*, a distance of 6 miles, in a rough sea, taking with them bananas, plantains, taro, coconuts, and mats.

Water.—There is a small running stream on the west side, but the surf would prevent it being used.

Landing in a canoe is, on the west side, easy in moderate weather, but not recommended for ships' boats.

Rocks.—At the distance of 1 mile from the southern end of the island is Southeast Rock, 20 feet above water, which is joined to the

shore by a rocky bank. A quarter of a mile outside the above-mentioned rock is an apparently isolated sunken rock, on which, in rough weather, the sea breaks heavily. Northeast Rock, upon which the sea breaks, lies 800 yards 76° from the north extreme. The reef fringing the island is shown on the plan as far as is known.

Bank.—The *Basilisk*, 1872, rounded the north end of the island at about 400 yards distance and saw no shoal, the only danger being a rock off the north end about 300 yards from the bluff. Immediately after passing the north point the *Basilisk* came upon an extensive coral bank, which was found to extend on a northwest bearing from the island for 4 miles, carrying a depth of from 12 to 19 fathoms (coarse white sand), the shoal water being the farthest from the island.

On this bank anchorage may be obtained, in moderate weather, during the season of the southeast trades. A long spit appears to extend from the southwest side of the island.

When making the island from the eastward, it is recommended to round the north point.

Fataka or Mitre Island.—This island is steep and covered with wood and consists of two hills and a rock, giving it the appearance of a miter. When seen from the eastward, it appears like two separate haycocks, apparently both of the same height, but the southern one more rugged than the other. It is bare of vegetation, and the high rock on its north side looks like a ship under sail.

This island is uninhabited, but is visited at times by people from Tucopia, who catch birds and sharks. These people also assert that there is fresh water on the island.

It is in latitude $11^{\circ} 55' S.$, longitude $170^{\circ} 10' E.$, and under the protectorate of Great Britain since January 28, 1899.

Santa Cruz Islands.—This group lies to the north of the New Hebrides and consists of seven larger islands, Vanikoro, Tevai, Ndeni (Santa Cruz), Te Motu, Tinakula, and Lord Howe, together with several smaller ones lying to the northeast of Tinakula, known as the Swallow Group. They are all under the protectorate of Great Britain since January 28, 1899.

In 1898 the natives were found to be friendly.

It was on the southwest side of the island of Vanikoro that the ships of La Pérouse were wrecked in 1788, and as recently as 1883 some anchors, guns, and other relics were found there.

Vanikoro (La Perouse) Islands.—These islands consist of Vanikoro and Tevai, with several islets. Vanikoro, the larger island, is 13 miles in length in a northwest and southeast direction and about 7 miles maximum breadth, and attains a height of 3,031 feet in Mount Kapogo.

Tevai, 8 miles in length by 4 miles in breadth, nearly fills the large bay on the northeast side of Vanikoro, with passages on either side of it.

The barrier reef encircling the islands in some places extends $2\frac{1}{2}$ miles from the shore, for which see the plan. Vanikoro Island is named by the French *Ile de la Recherche*.

The island is of volcanic origin, Mount Kapogo rising 3,031 feet above the sea, and streams of lava are still perceptible. The mountains generally descend direct to the sea, leaving very little level ground in the interior. When seen from a distance to the eastward it presents three flat-topped hills, like three separate islands.

The barrier reef opposite Peou and Ambi, on the southwest side, approaches to within a little more than 1 mile from the shore. It was there in an opening in the breakers that the boats of the *Astrolabe* found, under water, the remains of the wreck of the ship commanded by La Pérouse.

The sandy beach at Peou forms a good landmark, as it can be seen from a distance. That beach, with a small patch about $\frac{1}{2}$ mile to the eastward, are all that can be found within a stretch of 5 or 6 miles.

Between the barrier reef and the shore reef the depth varies from 10 to 45 fathoms, but there are numerous coral rocks, some of them rising like columns, a few yards only in diameter, rendering the inner navigation very dangerous.

Landing.—The mangrove grows down to the water and in most places prevents landing. A shore reef also encircles nearly every part of the coast of each of these islands, rendering the approach by boat difficult. The small beach at Ocili in Tevai Bay and at Peou on the southwest side of Vanikoro Island are about the only exceptions.

Climate.—The climate of the island is damp, hot, and unhealthful, even to the natives, who are covered with ulcers and are often sick; therefore it is deadly for Europeans.

Supplies are scarce at Vanikoro. Pigs are few and dear, but taro, coconuts, bananas, sweet potatoes, and breadfruit may be procured. Fish is abundant, though there is but little variety in the species. The small beach at Ocili is a good place for hauling the seine. There are also good oysters, some turtle, and shellfish. Firewood may be cut close to the shore.

Water.—Besides the stream in Ocili Bay, where water may be procured at low tide, there is a rivulet bearing 302° from Manevai Island, into which boats can enter.

Anchorage.—The ordinary anchorages at the east end are at Ocili in Tevai Bay and in Manevai Bay. Of these the second only is secure. To the westward there is anchorage off Peou and to the northward of Vanu village. The latter is used by coasters. Fowls and vegetables may sometimes be obtained at Ocili.

Tides.—It is high water, full and change, at 4h. 50m.; springs rise $4\frac{1}{2}$ feet. The tidal streams are weak round the coast of the island and strong round the inner side of the reef. The flood runs to the eastward and the ebb to the west, attaining the maximum rate of 3 knots in the passes.

Current.—In the open space between the New Hebrides and Santa Cruz Islands the current generally runs to the westward, sometimes southwest, at others northwest, according to the inclination of the wind to the northeast or southeast, and probably varying in rate according to the force of the established breeze.

Tevai Bay, between the south side of Tevai and the east end of Vanikoro, is about 2 miles wide in the entrance and about 2 miles in length. The entrance is reduced to about a mile in width by the reefs extending from both sides, and there is a patch of 2 fathoms in the fairway. There is anchorage in Ocili Bay in the south corner, and farther westward there is a narrow channel, Dillon Passage, leading to Lushington Bay and the anchorages in Manevai and Mangadai Bays.

Middle Bank, nearly 200 yards in extent, lies in the fairway at about 800 yards northward of Dillon Head, south point of the entrance.

Pearl Reef is a sunken coral patch about 100 yards in extent, with 6 feet water, from which Dillon Head bears 178° about 400 yards.

The sea seldom breaks upon this danger, which is situated nearly in the fairway between Middle Bank and the northern extremity of the fringing reef off Dillon Head, from which it is about 200 yards distant.

Deceitful Reef lies 400 yards southwest of Pearl Reef and near the reef fringing Dillon Head.

Treacherous Shoal, on the north side of Ocili Harbor, uncovers at low water about 200 yards in extent, but it projects under water to the northwest by north and to the east by north, in which directions vessels should give it a berth of 200 yards at least.

Ocili Harbor lies between the shore reef eastward of Ocili watering place and Treacherous Shoal, and has depths of 13 to 20 fathoms on the plan.

When anchoring, care should be taken to secure room to swing, as a sunken spit extends in a northeast direction from the shore reef on the west side of the bight and north of the stream, which leaves a space less than 200 yards between it and the dry part of Treacherous Shoal.

The swell frequently sets into Ocili anchorage, which is exposed to the eastward. If required to remain a considerable time, it will be better for a small craft to enter Manevai Bay through Dillon Passage.

Directions.—Entering Tevai Bay, steer in with the highest part

of Manevai Island, westward of Dillon Passage, bearing 273° until the center of Dillon Head bears 200° , when course should be altered to 240° for Ocili Harbor, passing between Middle Bank and Pearl Reef. A good lookout from aloft must be kept, in order to avoid Pearl Reef, upon which the sea seldom breaks.

Tides.—On entering it is necessary to watch the set of the tidal streams, which here, as at all islands inclosed by reefs, are very strong.

Dillon Passage, leading from Tevai Bay to Manevai Bay, is 600 yards wide from land to land, but is narrowed by the reefs projecting from each side to 150 yards, and in the remaining space there are detached shoals, to the north of which the passage is impracticable; that on the south side is 30 yards wide and about 4 fathoms deep. It must be navigated by the eye.

Proceeding westward, when the southwest point of Tevai bears north the open water will be reached and a course about 301° steered toward Mangrove Island, changing to 279° when necessary, so as to pass the north side of that island at 200 yards, and after following round the west side of the reef anchorage may be taken in Mangadai Bay as convenient.

Manevai Bay.—This comprises two bays, an outer and inner, the latter being called Mangadai. To the outer part there are two entrances, one to the east communicating with Tevai Bay by Dillon Passage, just described; the other to the north through Hayes Channel.

Anchorage.—The best anchorage is in Mangadai Bay in 14 to 16 fathoms, muddy bottom, protected from all winds.

The shores of these bays are bordered by reefs, which render landing difficult. At high water when the reefs are covered the two bays appear as one, but at low water the clear space is much contracted, and the reefs which are left uncovered and exposed to the rays of the sun emit very disagreeable exhalations.

Northeast Passage, leading to Manevai Bay, lies northeast and north of Tevai Island. It is $1\frac{1}{2}$ miles wide between the island and the east end of the reef, but the depth here is very irregular, rising from 30 fathoms to $4\frac{1}{2}$ fathoms over coral in the fairway. After that ridge is passed on either side no bottom will be found with 45 fathoms of line throughout a space of 2 miles while running to the westward, and then a number of dangerous shoal patches of coral must be passed with caution. When used by a person acquainted with the locality, or if it be marked by boats or buoys, this is far preferable to Dillon Passage.

Hayes Channel or North Passage entrance lies 3° from the west side of Tevai Island. The opening through the outer reef is about 1 mile in length, funnel shaped, being over $\frac{1}{2}$ mile wide at the outer part and barely $\frac{1}{4}$ mile at the inner end, where a patch lies in the

fairway, covered by $2\frac{3}{4}$ fathoms, which necessitates skirting the reef on either side (but the east is preferable) and also keeping a good lookout from the masthead. The reef on the east side also extends nearly 1 mile northeastward from the entrance, protecting it from the swell and insuring smooth water during the prevailing winds.

When within and eastward of the fairway patch, the course should be about 178° , in order to give Mambili Point a wide berth, as shoals extend from it fully $\frac{1}{2}$ mile. From Tevai the shore reef extends about half that distance. A good lookout must be continually kept for undiscovered heads of coral springing up from deep water.

Anchorage.—Having entered Manevai Bay, anchorage may be taken in the open space northeast of Mausoleum Bank, in 28 fathoms, muddy bottom, or pass between Mausoleum Bank and Manevai Island into Mangadai Bay.

Naunha Passages, on the north side of the island, at 4 and $2\frac{1}{2}$ miles westward of Hayes Channel, may be found useful. The first is about 600 yards westward of the low islet Naunha. There is a shoal in the center of the passage which has not been examined. The other passage is about $\frac{3}{4}$ mile eastward of Naunha Islet, and has a considerable space with 7 to 9 fathoms; but there are some patches with $4\frac{1}{2}$ and 5 fathoms over them. Schooners trading with Vanu village, at the northwest end of the island, use this passage.

Within the south barrier.—**Boussole Reef**, lying from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles to the southward of the east end of Vanikoro, is 3 miles long, having Nungna Islet about 1 mile from the east end, which is named Miller Point. The sand islet formerly at the west end has been washed away. A sunken reef and some heads of coral extend a considerable distance $\frac{1}{2}$ mile or more to the eastward of Miller Point. When taking the passage between Boussole Reef and the shoal 2 or 3 miles east of Astrolabe Point do not go within 1 mile of the former. As far as Nimbe Bay a vessel may be conducted by a lookout from the masthead.

Nimbe Bay.—Between the shore reefs off the points forming the bay there are three detached reefs with passages between them. Near the center of the bay four narrow heads of coral were seen and there may be others.

Dean Passage, in the barrier reef, trends north and south. The course from it to Nimbe Bay is about 20° for $1\frac{1}{2}$ miles.

Saboe Bay is on the south side of Vanikoro Island and 4 miles westward of Nimbe Bay. According to Dillon, it affords an anchorage with perfect protection, but there is no description of it.

Pallu Passage is the first known opening in the reef to the westward of Dean Passage, a distance of $7\frac{1}{2}$ miles. It is about 300 yards wide and deep. The course through is about 32° . The remarkable beach at Peou on each side of the river's mouth bearing 26° will lead

to it. After entering, the small detached beach 1,100 yards southeast of Peou should be brought to bear 43° and steered for till the west end of the sandy beach at Peou bears 358° , when that line should be followed to the anchorage, avoiding patches by navigating from aloft.

Bruat Passage lies northwestward of Pallu Passage. A small patch of coral close to the entrance of this passage appears by the chart to be on the northwest side; therefore vessels should navigate on the southeast side. Though the currents are stronger in this narrow channel than in Pallu Passage, it offers the advantage of a direct clear course to the anchorage off Peou.

Caution.—When entering either of the passages and approaching Peou use every precaution, as only a cursory examination of that part of Vanikoro has been made, and the strength of the currents within the reefs is so great that it is difficult to preserve a bearing.

Peou anchorage and village.—The mouth of Laurence River is between two narrow strips of sandy beach. To the westward of the river a clump of coconut trees indicates the position of the small village Peou. The anchorage is on black mud, close off the village.

The natives of Peou are very poor and timid. They have preserved the tradition respecting the wreck of *La P rouse* in 1788, as it was near their village that the crews of the *Astrolabe* and *Boussole* established themselves during 10 months, while occupied in constructing a small vessel, by which they left, and were not again heard of.

False or Wreck Passage is situated about 2 miles westward from the beach to the westward of Peou. It is obstructed by coral rocks, and it was upon one of them, a little to the south and east of the center of the opening, that one of the vessels under *La P rouse* was wrecked, of which fragments were found by the French Government vessel *Bruat* in 1883.

Ambi Bay is more than 1 mile northwest of Peou. The Des Esprits River has been described as beautiful. The shoal to the westward has depths of 3 to 5 fathoms.

There is another apparently false passage through the *Astrolabe* Reef at over 2 miles 273° from Nedju Point, the northwest extremity of the island.

Utupua (Edgecumbe) Island lies about 20 miles to the northwest of Vanikoro. It is completely encircled by a coral reef, which extends in some places to about $2\frac{1}{2}$ miles from the shore. For 3 or 4 miles on the northwest side of the island the encircling coral reef has from 1 to 2 fathoms on it, but the sea does not break except in heavy weather. Farther to the southwest the reef is awash.

Villages.—The principal villages are on the north coast of the island. The natives are numerous, good looking, and hospitable.

Basilisk Harbor—Ringdove Passage.—On the west side is an inlet from 4 to 5 miles in length, which nearly divides the island. It is known as Basilisk Harbor, the approach to which is by Ringdove Passage.

Ringdove Passage, about 400 yards wide between the barrier reefs, is situated about $1\frac{1}{2}$ miles southwestward of Moresby Point. From the sketch survey by the *Ringdove* the channel is deep, with a patch of $3\frac{1}{4}$ fathoms just within the eastern reef and a patch of $4\frac{1}{2}$ fathoms close off the northeast extreme of the western reef.

Caution.—In the old remarks from the British naval vessel *Basilisk*, 1872, the passage is said to have only 4 fathoms, and that depth was found on the southern side. This seems quite impossible from the survey by the *Ringdove*, which shows very deep water; but until a proper survey is made vessels should use this channel with great caution.

Directions.—The leading mark through the passage is a conspicuous clump of trees bearing 52° ; this clump of trees is, however, only conspicuous when on or near that bearing. The position of the passage may be recognized by three large boulders on the outer reef, about $\frac{1}{2}$ mile southeastward of the passage. The tidal streams run strongly across the passage.

Inshore passage.—Between Utupua Island and the barrier reef there are channels between the shoals. The mission vessel *Southern Cross* steamed from Basilisk Harbor round the north coast of Utupua Island to the east coast inside the reef.

It is high water, full and change, in Basilisk Harbor at 6h.; springs rise about 6 feet.

Ndeni or Santa Cruz Island was discovered by Mendana in 1595, who arrived there with three vessels, with the intention of founding a colony, but the animosity of the natives, dissensions among the Spaniards, and the death of Mendana caused the project to be abandoned. The island was visited by the *Swallow* in 1767, when Carteret gave it the name of Egmont. The intercourse with the natives was not more pacific than on the former occasion. Carteret sailed along the north side of the island and made a chart of it, which was improved in 1793 by d'Entrecasteaux.

The mountains at the northeast end are about 1,800 feet above the sea. Both north and south coasts present many bays, some of them receding a considerable distance, but those on the north side only have been described.

Natives.—The island is thickly populated. The arrows used by the natives were poisoned.

Anchorage.—The known anchorages about this island are not numerous, but the south side has not been examined. On the north-

west side the best place is in Graciosa Bay. Farther to the eastward on the north side will be found Byron, Carlisle, and Swallow Bays, which are small and insecure.

Carlisle Bay affords good shelter from southeast and south winds, but is partly open to the northeast. The leading mark for entering is the whitewashed wall in front of the Goodenough memorial bearing 189° . As the wall and the memorial are found to be very soon covered with creepers, it is not always possible to distinguish either of them, but the reefs on either side are probably discernible by the eye.

Commodore Goodenough was murdered here by a native when visiting the islands in 1875.

Bomalú or Byron Bay is 7 miles to the westward of Cape Byron and rather less than 1 mile west of Carlisle Bay. It is a small opening in the land only $\frac{1}{4}$ mile north and south and less than that in width. The south and west sides present a continuous sandy beach and some rocks lie off the west point.

The center of the bay is the best position in 15 to 20 fathoms, sand and mud. The *Rosario* (steam sloop) anchored in this bay in 12 fathoms, soft mud, with Hayes Point bearing 54° and Berkey Point 324° .

The stream, which affords good water at 150 yards in from the shore, is about the center of the southern beach. Another stream runs into the southeast angle of the bay, but the water is not good.

Supplies.—The *Rosario* obtained by barter plantains, coconuts, yams, fowls, and flying fish.

Swallow (Bloody) Bay is only a slight recession of the coast line, about 2 miles west of Cape Byron. There are rocks off each point forming the bay. The depth is very great (even close to the shore opposite the river) over sand and mud; not good holding ground. It was in this bay that Carteret anchored when he visited the island.

Water and firewood may be procured.

East coast.—**Discolored water**, about $\frac{1}{4}$ mile in extent, on which soundings of 11 to 15 fathoms were taken, was found by the *Sparrow* to the eastward of the island with Cape Byron bearing 299° , and Cape Barrington 241° . Other patches of discolored water were found with soundings of 10 to 12 fathoms $1\frac{1}{2}$ miles 133° from the above. Another patch is reported by the trader at Santa Cruz to lie with Cape Barrington bearing 273° , distant 6 miles, with a least depth of only 4 fathoms.

Lord Howe Island, situated off the southeast end of Santa Cruz Island, is 3 miles in length and 1 mile in width, of moderate height, covered with trees. It is separated from the large island by a deep channel from 1 to $1\frac{1}{2}$ miles wide.

Northwest coast.—**Trevanion (Temotu) Island** is off the northwest side of Santa Cruz Island and opposite Graciosa Bay. The name Trevanion was given by Carteret. It is roughly in the form of a triangle about $2\frac{1}{2}$ miles each way, rather low, covered with trees, and about 1 mile from the shore.

Anchorage can be found in a small bay which lies to the southward of the west entrance of West Passage. It is well sheltered from prevailing winds. The anchorage is very restricted, there being only 400 yards between the reefs.

Graciosa Bay is about $3\frac{1}{2}$ miles in length in a north-and-south direction, and its general width is $1\frac{1}{2}$ to 2 miles. Trevanion Island protects it from northerly wind and sea, southward of which is West Passage. There is secure anchorage at the inner part of the bay on good holding ground.

A coral bank with depths of from 8 to 20 fathoms lies 1,200 yards from the head of this bay. The British naval vessel *Torch* anchored on this in $9\frac{1}{2}$ fathoms, with the observation spot bearing 144° , distant 1,200 yards, and the extreme of land on the east side of the bay 20° .

The British naval vessel *Ringdove* anchored on another bank of 8 fathoms at about 600 yards from the head of the bay, and lying 121° of the above.

West Passage, between Trevanion Island and the north of Santa Cruz leads into Graciosa Bay. Its eastern end is divided by a reef on which there is a black rock. The southern branch is the clearest and straightest; the northern is more sinuous. The French naval vessel *Scorff* went by this latter passage and reports it as 100 yards wide.

The currents are somewhat strong in the passage, running to the west with the ebb. Its passage is not recommended for other than small craft.

Where the passage divides into two branches counter currents and eddies will be found.

Supplies.—Wood and water are procurable, also some provisions by barter from the natives; but strangers should always be on their guard and act toward them with the greatest prudence, as they were formerly said to have a quarrelsome disposition.

Tinakula (Volcano or Tamami) Island, lying 16 miles northward of the northwest extreme of Santa Cruz, is a volcanic cone, rising to the height of 2,200 feet. The lower portion is covered with vegetation, apparently most luxuriant nearest the sea. The upper part is entirely barren. Reported to be situated 6 miles farther southeastward.

No traces of inhabitants were seen. When the British naval vessel *Rosario* was here in 1871 a stream of lava was flowing down the north-

west side. Flames and smoke were also emitted at intervals of from 10 to 15 minutes.

In 1886 the British naval vessel *Opal* visited this island, and the volcano is described as having recently been active.

In 1827 it was in eruption.

Forrest Reef.—A reef was reported in 1899 to be situated between Tinakula and Nalogo, Swallow Group. Approximate position, to be considered doubtful, latitude $10^{\circ} 17' S.$, longitude $165^{\circ} 45' E.$ The British naval vessel *Ringdove* examined the position of this reef and found a bank about 400 yards in extent east and west, with depths of 45 to 48 fathoms. As the bottom was clearly seen, it is probable there is shoaler water in the vicinity.

The natives report another reef to the westward of the above. Being an earthquake locality, it is probable that it and others exist, and caution is necessary.

Matema or Swallow Islands, under British protection, and forming part of the Santa Cruz Group, lie to the north and northeast of Tinakula Island, and between the parallels of $10^{\circ} 4'$ and $10^{\circ} 22' S.$, extending from longitude $165^{\circ} 39'$ to $166^{\circ} 19' E.$, occupying an extent of about 42 miles in an east-and-west direction from Nibanga, the southeastern of the group, to Nupani, the northwestern. They are from 100 to 200 feet in height, and dangerous on account of the extensive reefs which stretch out, especially from their western or lee sides.

The inhabitants were formerly reputed to be rough, treacherous, and fearless, and appear to be a mixture of the Polynesian and Melanesian races. They come off eagerly to barter mats, bows and arrows, and a fruit resembling in appearance an apple. They appear to be bold navigators, sailing in their double canoes as far as Tucopia, which lies about 180 miles to the southeast.

Nibanga, the southeastern island of the group, is in latitude $10^{\circ} 21' S.$, longitude $166^{\circ} 17' E.$, and is a small, round, bold-looking island some 200 feet high, with apparently deep water around. There is a land slip and probably a landing place on its lee side. The correct name of this island is Banga Ndeni, which means the island nearer Ndeni (Santa Cruz).

Banga Netepa (Banepi) is the eastern island of the group. It lies in latitude $10^{\circ} 17' S.$, longitude $166^{\circ} 19' E.$, distant about 4 miles northward of Nibanga, to which it is similar in size and appearance, but not quite so high. It is well wooded. On the western side there is a small bight with a steep white beach.

Lomlom is about 4 miles long east and west, $1\frac{1}{4}$ broad, and about 200 feet high. It is the eastern island of the group known as the Reef Island. Lomlom appears to be clear of dangers except off its south-

west extreme, where a reef extends about 211° for $1\frac{1}{2}$ miles, with several large rocks or islets within its edge.

Mohawk Bay is on the western side of Lomlom. It is necessary to moor in it, as the anchorage is confined.

Fenualoa Island trends north and south, is $1\frac{1}{2}$ miles long by less than 1 mile wide, and between 100 and 200 feet high. The weather or eastern side is bold, and from a bluff on the northeast coast commences an extensive barrier reef, encircling Nifiloli, the next island, and then trends westward for nearly 13 miles.

The villages on these islands are probably situated inland, or on the western side which faces the lagoon, as only one hut, resembling a boathouse, was seen from the sea.

A reef extends off the southern end of Fenualoa Island in a southwest by west direction for $1\frac{1}{2}$ miles, there being a boat passage at high water near the shore. There is deep water between this reef and the reef next west of it, and between these reefs, but a little to the northward there is a small sand islet about 50 yards wide.

Inside the barrier reef coral patches will be found in all directions, and it is only navigable for very small craft.

Forrest Passage was used by the British naval vessel *Torch* in 1897 and reported to be deep and apparently clear.

Nifiloli lies about 1 mile northward of Fenualoa, and is 1 mile long northwest and southeast and 120 feet high. The reef trends close round its northeast side, and then trends to the west and southwest for about 2 miles, forming a bay with a low rock on the edge. A small, round islet about 40 feet high lies $\frac{1}{2}$ mile within the reef.

Pileni, the next island westward of Nifiloli, from which it is distant 3 miles, trends northwest and southeast, is about 1 mile in length and about 120 feet high. There is a village on its southwest point. Pileni lies outside the barrier reef, but is surrounded by a reef, which, passing close round its eastern side, extends about $\frac{3}{4}$ mile to the southwest from its western coast. There is apparently a deep-water channel between the barrier and Pileni Reefs.

Sand Islet is merely what its name indicates. It is small, about 10 feet high, and without vegetation, the natives resorting to it only to fish. This islet lies on the western side of an oval ring of coral, about 1 mile in extent, similar to that of Pileni, and also without the barrier reef, and is the only example in this group of the reef extending to windward of the land to which it is attached. There is a clear space of $1\frac{1}{2}$ miles between this reef and that of Pileni and also a deep-water channel of $\frac{3}{4}$ mile between it and the edge of the barrier reef.

The Great or Barrier Reef.—From Sand Islet the western entrance of the lagoon in the Reef Islands Group lies southwest, distant about $6\frac{1}{2}$ miles. This extreme lies in latitude $10^{\circ} 14' S.$, longitude

166° E. From it the reef trends round to the eastward, forming the north side of an apparently deep-water entrance to the lagoon between the West Point and Southwest Patch, the latter, a reef about 2 miles long, lying $3\frac{1}{2}$ miles 133° from the point.

Eastward of Southwest Patch, with an apparently deep-water channel $1\frac{1}{2}$ miles wide between them, lies another patch of coral nearly 3 miles long. Between this and the reef from Lomlom Island is a third patch, the channels on either side into the main lagoon appearing to be deep, and apparently leading to a secure anchorage under the lee of Fenualoa Island, the coast of which appeared to be beach with villages built near it. The interior of the main lagoon seemed to be patchy, but little could be distinguished from the masthead of the *Southern Cross*. These passages could only be navigated by eye.

The current was found setting to the southwest along the north side of the reef, and overfalls were experienced off its western point.

Matema, the only island on the southern side of the Great Reef, lies about midway between Lomlom Island and West Point of Great Reef, being nearly 6 miles on a 290° bearing from the southern extreme of Lomlom Reef. It is a small island, 100 feet high, inhabited (the landing being on the western side), and surrounded by a reef which extends about 670 yards from its coast. There is apparently a narrow passage between this island and the middle coral patch of the main reef which appears to be clear.

Nukapu lies about 8 miles northwest of the Great Reef. It is narrow, about 120 feet high, and nearly 1 mile long, with a low termination to the southward, where the villages appear to be. A reef encircles the island, passing close to its eastern shore, but extending about $1\frac{1}{2}$ miles from its western side.

It was at this island that Bishop Patteson and his companions were attacked and killed on September 20, 1871.

Nalogo and Nupani, the western islands of the Matema Group, are similar to Nukapu in size and shape. They are surrounded by an extensive and irregularly shaped reef, which, passing close to their eastern sides, stretches out to the southwest for nearly 3 miles from Nalogo, the southern of the two islands.

Nalogo lies about 17 miles westward of Nukapu, and is about 1 mile long, 120 feet high, and situated in the eastern angle of the reef surrounding the two islands.

Nupani lies about 2 miles northwest from Nalogo, the reef forming a bight between. It extends north and south for about 1 mile, and is 120 feet high, the northern point being in latitude 10° 4' S., longitude, 165° 40' E. The reef passes close along the east and north sides of Nupani, from whence it trends to the westward for $\frac{1}{2}$ mile, then sweeps round to the southward and eastward for $2\frac{1}{2}$ miles, from whence it stretches out to the southwest, forming a large and dangerous bight

of smooth water nearly 4 miles between the horns. The southwest point of the reef usually breaks.

Duff or Wilson Group.—This group, lying about 55 miles to the northeast of Lomlom, Reef Islands, was discovered by Quiros, who gave the name of Tuamaco to the principal island. They are 11 in number extending 17 miles in a northwest and southeast direction, and consist apparently of volcanic rocks, the easternmost being columnar and covered with trees.

They are under the protection of Great Britain.

Netepa (Disappointment) Island, the largest of the group, is about 1,200 feet in height. The British naval vessel *Basilisk* (1872) anchored off this island in 10 fathoms on the following bearings: Village 56° southern islet 101° , about $1\frac{1}{2}$ miles from the shore, having 4 fathoms about 100 yards farther in. With a light northeast breeze the stream anchor dragged off this bank into 100 fathoms, no bottom. Several such coral banks with very deep water between them were found inside of the anchorage.

The village is situated on the southwest side, and is visible some distance, being built on a flat coral islet about 200 yards in diameter, and separated from the mainland by a narrow lagoon. A coral wall is built round this islet, and coconut trees grow between the houses. A shore reef has to be crossed to effect a landing which is generally impracticable for boats.

The natives are Polynesians, of good stature, all armed with efficient bows and poisoned arrows; they have also large war canoes (1872). They were at first shy, but soon gained confidence and became friendly.

Bass Islands, about 200 feet in height, extend 5 miles southeastward of Disappointment Island, and form the extreme of the group in that direction.

Treasurers Island, from 150 to 175 feet in height, with a village on its south side, is the second in size, and lies about 6 miles northwestward of Netepa or Disappointment Island. Between them is a small islet. To the northwestward are five more, some of them being high, and at the east end of one is a remarkable rock in the form of an obelisk, hence its name, Obelisk Island.

The small islands appear barren, but the two larger ones are covered with trees, among which are several coconut palms, but on the whole they do not appear fertile.

Doubtful Shoals.—**Hallie Jackson Shoal**, having upon it 4 fathoms of water and possibly less, is charted about 28 miles westward of Treasurers Island of the Duff Group in latitude $9^{\circ} 53' 00''$ S., longitude $166^{\circ} 39' 30''$ E. It was reported by the *Hallie Jackson*. The shoal is said to extend in a north-and-south direction for about 3 miles.

Goldfinch Shoal, reported in 1898, lies about 25 miles southwestward of the Duff or Wilson Group. Nine fathoms was obtained in approximately latitude $10^{\circ} 14' S.$, longitude $166^{\circ} 54' E.$

Patteson Shoal, in latitude $9^{\circ} 44' S.$, longitude $166^{\circ} 7' E.$ (approximate), was reported by the mission schooner *Southern Cross* in 1871.

Brougham Shoal, reported in 1846, is charted west-northwest of the preceding, in latitude $9^{\circ} 30' S.$, longitude $165^{\circ} 30' E.$

Hawkins Shoal, about 4 miles in extent, on which the least depth obtained was 8 fathoms (1882), is charted 155° ; distant about 23 miles from Netepa or Disappointment Island, in latitude $10^{\circ} 18' S.$, longitude $167^{\circ} 22' E.$

A shoal on which 10 fathoms was obtained (1883) lies with Netepa or Disappointment Island bearing 279° , distant about 12 miles.

CHAPTER XI.

SOLOMON ISLANDS—EASTERN ISLANDS OF THE GROUP.

General remarks.—The Solomon Islands, so named by Mendana, the Spanish discoverer, in 1567, cover an area 600 miles in length in a northwest and southeast direction, and include seven or eight large mountainous islands attaining a height, as in the case of Guadalcanar and Bougainville, of from 8,000 to 10,000 feet above high water, and having lengths varying from 70 to 100 miles and breadths between 20 and 30 miles. In addition there are a great number of smaller islands, varying in size from those of from 15 to 20 miles in length to the small coral islets.

In appearance the islands present many similar characteristics, consisting of a chain of lofty mountains, for the most part covered with dense forest and rank undergrowth, here and there giving place to long grass and ferns. The slopes incline gently to the sea, and the shores are fringed with mangroves in places.

The larger islands are well watered by numerous streams, at the mouths of which, as well as on the swamps and sandy shores of uninhabited coral islets, alligators abound.

Some of these islands are entirely of volcanic formation, while others are calcareous, but there are also many cases in which both these formations are combined.

Bagana, in Bougainville Island, is an active volcano, and Savo, Narovo, and other islands sometimes exhibit signs of latent activity. Fumaroles and hot springs occur in several islands, and around these deposits of sulphur, alum, gypsum, and opal may be found.

Caution.—Extensive lines of barrier reef occur in parts of the group, as off the east coast of New Georgia, the island of Ysabel, and the south coast of Choiseul. Some of these, as well as the greater portion of the islands, are still imperfectly known; much caution, therefore, is necessary when navigating among the group.

Missions.—The Melanesian mission has established stations on many of the islands, the principal of which are visited three times annually by the mission steamer from Sydney.

Inhabitants.—The inhabitants of the Solomon Islands are Papuans, but the type varies considerably in different parts of the

group, in some approaching the pure Melanesian, in others the Polynesian, while a few show traces of the Malay. They are usually of moderate height and well proportioned, but in appearance they can not be called attractive. The language comprises many different dialects. Owing to frequent intercourse with whites, but more to the labors of the missionaries, the treacherous and bloodthirsty character hitherto borne by the natives has been modified, but every precaution should be taken against surprise by small parties dealing with them.

Bauro (San Cristoval) Island is the largest island at the south-eastern end of the Solomon Group. It is 78 miles in length in a north-west by north and opposite direction, its greatest breadth being 22 miles.

The summit, toward its southeastern end, is 4,100 feet above high water. Between Cape Surville, the east point, and Owa Raha Island there is a deep-water channel $3\frac{1}{2}$ miles broad.

Aspect.—The north coast of Bauro Island, with the exception of a precipitous portion between Mahua (Cape Kibeck) and Flat Rock, is skirted by a margin of low-lying land fringed by reefs along a portion of its extent; the southern coast rises for the most part precipitously from the sea. The general character of the mountainous interior of the island is that of a parallel series of level-topped ridges, separated by deep valleys, with here and there a dome-shaped or conical mountain.

Cape Surville (lat. $10^{\circ} 50' S.$, long. $162^{\circ} 23' E.$) is the extremity of the peninsula, about 9 miles in length, and from 1 mile to 2 miles wide, forming the southeastern extreme of the island. The cape is fringed by reef, which extends about 1 mile northward, $\frac{3}{4}$ mile southward, and 1,400 yards to the northeastward of it.

Puramatara Islet, wooded, and 70 feet above high water, is situated on the fringing reef off the northeastern side of the cape.

From this islet the coast trends westward for 4 miles to Bunny Island, the fringing reef extending from 1,000 yards to 1 mile from the shore, and having numerous indentations, in any of which a small vessel may obtain anchorage.

Bunny Island is small, 60 feet above high water, and situated on a detached coral reef, nearly $\frac{1}{2}$ mile offshore.

Bunny Anchorage is the first indentation in the reef eastward of Bunny Island, and here anchorage may be obtained, in a depth of 14 fathoms, over coral sand, well protected from any sea, with the center of the island bearing 318° , distant 500 yards.

Vessels proceeding for this anchorage should steer for Bunny Island on a 211° course, and when the entrance is made out alter course to south.

Between Bunny Island and the shore reef there is a passage, 200 yards wide, leading out to the westward, with not less than 5 fathoms

water in it. Care must be taken, however, not to haul to the northward until well clear of the channel, as a patch, with a depth of 3 fathoms over it, extends 200 yards to the westward from the island reef.

Star Harbor (lat. $10^{\circ} 50' S.$, long. $162^{\circ} 17' E.$).—At 2 miles westward of Bunny Island there is a similar islet on the reef, and southward of it is an anchorage named Star Harbor, which affords excellent shelter, in depths of from 10 to 15 fathoms, at all seasons. The entrance, between reefs extending from the shore eastward and from Sand Cay and Anchor Island on the western side, is about 600 yards wide, narrowing inside to 400 yards, and the positions of the anchorages will be best seen from the plan.

Coast.—Westward of Star Harbor is a shallow inlet $1\frac{1}{2}$ miles in length. From thence the coast trends northeastward and northward for 7 miles to Fanarite Point and village, and is fringed with coral reef, which has occasional breaks in it, the principal one of which is named I yo, where there are a few natives and a trading station.

Fanarite Point, off which is Tree Islet, 30 feet above high water, has several villages on it.

Mount Erskine is a conspicuous double peak, 1,560 feet above high water, southwestward of Fanarite Point, and is the easternmost of the high peaks of Bauro Island.

Coast.—Two and a half mile swestward of Fanarite Point is a river, with a sandy bar, reported navigable for boats for some distance.

From the river the coast trends in a north by west direction to Flat Rock, forming a large bay, with depths of from 8 to 11 fathoms at $\frac{1}{2}$ mile offshore.

There is, however, no safe anchorage, as during the southeast trade wind a swell rolls in on the beach and the wind frequently shifts to the northeastward.

Flat Rock, 15 feet above high water and about 80 yards in extent, lies about 600 yards off a point rising abruptly to a height of 970 feet.

Rocks about 20 feet above high water lie near the shore about $1\frac{1}{2}$ miles southward of Flat Rock.

Westward of Flat Rock there is a bay with shallow water extending about $\frac{1}{2}$ mile offshore.

Coast.—From Flat Rock the coast trends in a northwesterly direction for $10\frac{1}{2}$ miles to Mahua, the hills rising abruptly from the sea, with numerous streams running down between their ridges. Rocks, 10 feet above high water, front the coast at about 4 miles northward of Flat Rock.

In light winds sailing vessels should give this coast a wide berth, the swell generally setting on shore.

Mahua or Cape Kibeck is the most conspicuous promontory on the north coast, and with Kahua, $1\frac{1}{2}$ miles to the westward of it, forms a double point, in the bight of which temporary anchorage might be obtained, in 8 fathoms water; but the bottom being foul and a swell frequently setting in, it can not be recommended.

This lofty promontory attains, near the coast, an elevation of over 1,000 feet, and a few miles inland it reaches 2,000 feet above high water in the table-land of Kaiholongana.

Wanoni Bay, westward of Kahua Point and village, is about 6 miles wide. Four streams discharge into this bay, the largest of which brings down broken trees and snags during heavy rains and causes discoloration of the sea for some miles off the coast. The lower parts of these rivers are infested by alligators.

Anchorage may be obtained on the eastern side of the bay in a depth of 8 fathoms, over sand, 300 yards from a dark sandy beach situated $1\frac{1}{2}$ miles 99° from Kahua. The water deepens suddenly outside the depth.

Water can be obtained here from a small stream.

Tawaro Point is formed of coral limestone and terminates in a line of low cliffs. Sulipawa village is here situated, and westward of it a bay affords snug anchorage, in from 20 to 25 fathoms water, at 100 yards from the shore. A large stream runs into the head of the bay, which is foul to the distance of nearly $\frac{1}{2}$ mile off its western side.

Supplies.—A good supply of yams may be obtained at the village in exchange for articles of trade.

Manahinua Point, situated $2\frac{1}{2}$ miles westward of Tawaro Point, has a village of the same name on it. There is anchorage 1 mile westward of the village, in depths of from 5 to 7 fathoms, over sand, 500 yards from the shore.

Lakenna Point, which may be recognized by a conspicuous clump of trees, lies about 6 miles westward of Manahinua Point, the coast between them consisting of a dark sandy beach, on which, during strong southeast trade winds, the sea breaks heavily.

Maoraha Island (lat. $10^\circ 24' S.$, long. $161^\circ 44' E.$); with trees 50 feet above high water, lies 3 miles westward of Lakenna Point and 1,000 yards from the shore. The reef on which it stands extends a good 200 yards northward and eastward of it. A patch with $2\frac{3}{4}$ fathoms water over it lies between the island and the point southward of it.

Anchorage.—There is good anchorage in a depth of 19 fathoms at 300 yards from the island, with its center bearing 76° .

Coast.—**Castle Peak**, 460 feet above high water and $4\frac{1}{2}$ miles northwestward of Maoraha Island, is conspicuous, and takes its name from the shape of a clump of trees on it.

Wai ai Bay, immediately westward of Castle Peak, affords good anchorage in its southeastern corner, in depths of from 8 to 10 fathoms.

Water.—Good water is obtainable from the streams which flow into Wai ai Bay.

Wango Bay, 6 miles northwestward of Wai ai Bay, is 1,200 yards wide between Wangalaha and Comyns Points, and affords good anchorage in from 7 to 10 fathoms of water, over sandy bottom, but the swell sets in during a strong southeast trade.

Both points are fringed by reef to the distance of 200 yards, decreasing toward the head of the bay, the steep sandy beach of which is free from reef. A patch with a depth of $1\frac{1}{2}$ fathoms over it lies 200 yards off the eastern shore of the bay, with 6 fathoms close-to.

Supplies.—Oranges, bananas, eggs, and yams are obtainable from the natives, and pigeons abound. Water is obtainable from the river. Landing is difficult during a strong southeast trade, the mouth of the river being barred by rocks on which the sea breaks heavily.

Missions.—A Melanesian mission station is established here, and also at Haani, 4 miles to the southeastward.

Current.—The British naval vessel *Diamond* found a current setting to the southward at the rate of 1 knot per hour in the channel between Guadalcanar and Bauro Islands upon each of the three occasions of her visit.

Cape Recherche is the northernmost point of Bauro Island. The country around it appears to be thickly inhabited.

Maru Bay, about 3 miles southwestward of Cape Recherche, affords anchorage, in about 10 fathoms water, with shelter from southeasterly winds. Here there is a steep, dark beach. A white trader resides at this bay.

Water.—Fresh water may be obtained in Maru Bay.

Hada or Recherche Bay, situated 5 miles southward of Maru Bay, affords anchorage in 10 fathoms water, over mud and sand, at about 600 yards off the steep gravel beach at its head.

Water.—Hada River affords good drinking water, and small boats can enter it at high tide.

Tides.—It is high water, full and change, at about 9h.; springs rise from 4 to 6 feet.

Hada Mata, about $1\frac{1}{2}$ miles southward of Hada Bay, is said to afford anchorage for small vessels. Its shore is fronted by a reef.

South coast.—**Achard Point** (lat. $10^{\circ} 21' S.$, long. $161^{\circ} 15' E.$) is the south point of the western extreme of Bauro Island.

Yanuta village is situated on the northern side of an island about 1 mile in length, and which appears like a point of the mainland. The passage between is much obstructed by reefs. This village is a trading station.

It is reported that anchorage may be found inside by leaving Yanuta to the eastward and keeping well over to the main shore to avoid a spit extending off the island. Yanuta Rocks encumber its approach, and reef fronts the shore westward to Achard Point.

Coast.—Between Yanuta and Makira Bay, situated $7\frac{1}{2}$ miles south-eastward, lies Eyo Islet, about 300 feet above high water, and encircled by a reef; and between it and Makira is a shoal with estimated depths of from 6 to 10 feet over it, from which Eyo Islet bears 346° , distant about 1 mile. Bea village lies abreast this shoal with the coast southward of it fronted by reef to a distance of about $\frac{1}{2}$ mile. The *Royalist* anchored off here in 21 fathoms water, with Eyo Islet bearing 266° and the northern Makira Islet 211° .

Makira Bay (Leoue).—This harbor, hemmed in by hills from 600 to 900 feet above high water, and approached by an entrance $\frac{1}{4}$ mile wide, is over a mile in length, with depths of from 25 to 30 fathoms over the greater part of it, and is probably one of the best and safest in the group; it is, however, somewhat difficult for a stranger to recognize, especially if coming from the westward.

Dangers.—Passage Ledge, with a depth of $1\frac{1}{4}$ fathoms near its extreme, extends 600 yards southward of the northern shore of the approach into the fairway. The shore eastward and westward of the ledge is foul only to a short distance, but 200 yards off Observatory Point, the northern entrance point, is a detached patch with a depth of $1\frac{1}{4}$ fathoms over it.

A shallow patch lies 100 yards off the western shore at the northern head of the bay.

Asouni Island is situated on the southeastern shore of the bay with a $4\frac{1}{2}$ -fathom patch at 350 yards west by south of it.

The coast westward of the southern entrance point is fringed by reef to the distance of 300 yards, with a rock awash near its edge.

Lebua Reef extends about a mile in a southwest direction from the outer south point of the approach. There are other reefs southward of it.

Supplies.—Good water can be procured from a stream opposite the entrance, and native provisions can be obtained in small quantities.

Anchorage may be obtained in about 25 fathoms water, mud bottom, about 500 yards from the head of the northern arm, abreast the village of Makira or Lizitado, or in less water just northward of Observatory Point.

Directions.—Coming from the westward, after passing Achard Point, which may be distinguished by the white sandy beach to the eastward of it, a high double peak will be seen, which should be steered for when bearing 127° until the entrance to the harbor, which has two islets off its northwest point, is made out.

Coming from the eastward it may be recognized by Eyo, a remarkable little islet having a knob on one end, to the northward of the harbor, and Philip Island to the southward.

The southeast shoulder of Harbor Ridge (914 feet above high water), just open of Observatory Point, bearing 59° , leads southward of Passage Ledge. When eastward of it steer to pass about midway between the entrance points.

The wind is generally light and baffling under the high land, but a light land breeze early in the morning enables a sailing vessel to get out of the port before the sea breeze sets in.

Tides.—It is high water, full and change, in Makira Harbor at 6h. 45m. During the southeast trade the rise and fall in Makira Harbor is 4 feet, and in the opposite season the rise is 7 feet, at which time the current outside the harbor sets south by east 2 knots an hour.

Coast.—Lebua village is situated at the head of Lebua Cove, about $1\frac{1}{2}$ miles southward of Makira. Off the north point of the cove a reef extends about 1 mile, as before mentioned.

Cape D'Entrecasteaux (lat. $10^{\circ} 28' S.$, long. $161^{\circ} 26' E.$), about $1\frac{1}{2}$ miles southward of Lebua Cove, has a reef extending about 300 yards from it, with deep water close beyond it.

Marau Bay, lying between Cape D'Entrecasteaux and Marau Island, has several islets lie in it, and in the approach are the Cone Rocks, wooded and about 100 feet above high water, and Philip Island southwestward of them. A narrow reef, the extent of which is not known, lies about $\frac{1}{2}$ mile of Cape D'Entrecasteaux.

Cape Philip is the southeast extreme of Marau Island, which is about 2 miles square. Between it and Bauro Island there is a boat channel obstructed by coral reefs.

Anchorage.—There is anchorage off the northern side of Marau Island in from 8 to 10 fathoms water (*Royalist*, 1891). The water shoals rapidly from 20 to 8 fathoms, and from thence to the shore.

Manewai Harbor, lying in the southern approach to this channel, is apparently only suitable for very light draft vessels, and the approach is also shoal.

Current.—The British naval vessel *Renard* was becalmed for nine days in the month of May to the southward of Bauro Island, during which time she was set to the eastward when 10 miles offshore, while within that distance she was set east and west alternately. During the month of August an easterly set was experienced.

Marunga Harbor, 21 miles southeastward of Cape Philip, is reported to afford anchorage, in depths of from 8 to 12 fathoms, with a rock, off the inner point of the southern side of the bay, in line with the south point and the mouth of a stream, in the southeast corner of the bay, bearing 146° .

Owa Riki (Santa Catalina), situated about 4 miles southeastward of Cape Surville, the eastern extreme of Bauro Island, is a level-topped island, 320 feet above high water, of coral formation, thickly wooded, and surrounded by fringing reef, which renders landing difficult. The village, on the northern side of Owa Riki, contains about 100 inhabitants.

Owa Raha (Santa Anna), lying to the northward of Owa Riki, and separated from it by a clear channel $1\frac{1}{2}$ miles broad, presents the form of an upraised atoll, nearly circular, with a length and breadth of $2\frac{1}{2}$ and 2 miles, respectively. In it are two fresh-water lakes, and its whole surface, with the exception of cultivated patches, is densely wooded.

From the middle of its margin on the eastern side there rises a hill, 520 feet above high water, which gives the island, when viewed from the eastward or westward, a profile resembling a broad-brimmed low-crowned hat. Except in Port Mary, on the western side, it is surrounded by a fringing reef.

There are two villages on the island, Otagara on the eastern side and Upuna at Port Mary. A white trader resides on this island.

Port Mary (lat. $10^{\circ} 51' S.$, long. $162^{\circ} 27' E.$) affords good anchorage in a depth of 15 fathoms, over sandy bottom. The port is circular and about 800 yards in diameter, with an entrance 400 yards in width between the reefs on either side, but this is reduced to 250 yards by some detached rocks off the southern reef. The tidal streams frequently set diagonally across the channel.

Supplies.—Fresh water in small quantities may be procured from wells near the traders' houses southward of Upuna village, but with the exception of a few fowls and coconuts no supplies are obtainable.

Tides.—It is high water, full and change, in Port Mary at 4h. 10m.; springs rise during the southeast season, day tides from 4 to 5 feet, night tides 3 to 4 feet; during the northwest season the reverse probably takes place. Neaps rise from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet.

Tidal streams.—During the southeast trade the streams in mid-channel between Owa Raha and Bauro Island run at the rate of from 1 to 2 knots an hour during springs, the flood setting to the northward, the ebb to the southward. Off the points of the shore reefs during the strength of the trade there are tide rips which would be dangerous for boats.

Rennell Island (lat. $11^{\circ} 50' S.$, long. $160^{\circ} 40' E.$), situated about 90 miles southwestward of Bauro Island, is about 45 miles in length in a southeast by east and northwest by west direction, and not more than 6 or 7 miles in breadth at the widest part. It is of uniform height (about 400 feet above high water), is densely wooded, but has no signs of cultivation and apparently affords no anchorage. The

position given is that of the southeastern end; the western end is marked by a hummock situated about 200 yards within the beach.

Off the southeast end of the island a fringing reef extends a short distance and along the whole northeast side is a fringing reef, about 400 yards from the shore. A reef extends 800 or 1,000 yards from the western point, around which strong tide rips were observed. The channel between this island and Bellona Island is reported to be free from dangers to within $\frac{1}{2}$ mile of either shore, but at times there are strong tide rips.

Both islands are densely inhabited, but there is no anchorage off either of them.

Bellona Island, stated to lie about 15 miles 312° of Rennell Island, appears to be about the same height as that island. It is of coral formation, and fringed by a reef, which extends 400 yards off its northwest and southeast extremes. The only landing found possible was on a sandy beach at its northwest corner (*Wallaroo*, 1897). The island is covered with forest and dense undergrowth; a few coconut trees were observed.

There is apparently no anchorage off the island.

Protectorate.—These islands are included in the British protectorate.

Indispensable Reefs, lying between 30 and 70 miles southward of Rennell Island, were discovered in 1790. These dangers have been found to consist of three separate reefs, named, respectively, North, Middle, and South Reefs, and to extend in a northwest and southeast direction for a total distance of 57 miles. No anchorage of any sort could be observed outside, the reefs being steep to all round.

North Reef (lat. $12^\circ 15' S.$, long. $160^\circ 0' E.$), inclosing a deep-water lagoon, is 12 miles in length in an east-southeast and west-northwest direction, and its greatest breadth is 4 miles. The position given is that of the northwest point of the reef, which is marked by two conspicuous rocks. There are two openings in the reef, one on the western side, situated 3 miles southward of the two rocks, and the other on the northern side, 5 miles from the east point. Both openings are apparently narrow, and consequently difficult of entrance, especially the northern one, on account of the current.

Middle Reef, separated from North Reef by a passage from $1\frac{1}{2}$ to 2 miles wide, extends in a southeasterly direction for 22 miles to a point, off which is a heavy tidal rip, which might easily be mistaken for a continuation of the breakers. Thence the reef curves gradually to the westward and northward for 17 miles.

No soundings, with 150 fathoms of line, could be obtained between the extremities of this reef. The interior also appears very deep.

South Reef is separated from Middle Reef by a passage about 2 miles wide, in which no bottom, with 25 fathoms of line, could be

obtained. This reef incloses a deep-water lagoon, and is 13 miles in length by about 5 miles in breadth, and having a horseshoe curve in the southern side.

Anchorage.—The schooner *Curlew* (1896) entered the lagoon at the northwest corner, and found anchorage, in from 5 to 15 fathoms water, along its sides.

Winds and weather.—In the vicinity of the reefs during the first half of September the wind prevailed from southeast by south to east by south, force 3, with fine weather.

Occasionally it veered to northeastward when the shift was accompanied by thick weather, rain, and sometimes lightning. This weather was usually experienced at night, and was generally succeeded by southeasterly winds with clear weather in the daytime.

Current.—The current (September) here sets to the westward and on striking Indispensable Reefs appears to divide into two branches, one setting to the northwestward along the reef and the other to the southwestward.

Between Rennel Island and Indispensable Reefs the current sets strongly to the westward. A set of 49 miles in 24 hours was observed on one occasion.

The current is probably much influenced by the wind.

Imberhorne Reef (lat. $12^{\circ} 5' S.$, long. $162^{\circ} 39' E.$).—The master of the ship *Imberhorne* reported, in 1898, that when about 72 miles southeastward of Owa Rika, situated off the southeast extreme of Bauro Island, his vessel, of 22 feet draft, struck on a reef, the extent of which was not ascertained.

Soundings obtained by British surveying vessels on two occasions, while searching for this reef, show depths of not less than 2,000 fathoms within a radius of 12 miles around the position of this reported danger. It is therefore not considered to exist within the limits searched, and has been expunged from the charts.

Ugi Island, separated from the northern coast of Bauro Island by a channel 4 miles wide, is about 6 miles in length in a north-and-south direction by about $2\frac{1}{4}$ miles in breadth, and its summit is 670 feet above high water.

With the exception of Selwyn Bay, on the southwestern side, Ugi is fringed by a reef which extends from 200 yards to 1,000 yards offshore. There is a settlement in Selwyn Bay, and there are several villages on the island, the population being estimated at about 700. Interpreters for the eastern portion of the group can be obtained here.

Selwyn Bay (lat. $10^{\circ} 15' S.$, long. $161^{\circ} 43' E.$) affords good anchorage in depths of 17 fathoms, over sand, at 300 yards southwestward of the mouth of the northern stream in the bay, with good shelter during the southeast trade. Long vessels should anchor in

not less than 20 fathoms water. The shore between the two streams is said to be fronted by a shallow bank at times, the deposit brought down by those streams.

During the northwest monsoon anchorage may be obtained in the northern part of the bay, eastward of Nauta Nauta, the northwestern point, in about 20 fathoms water, but the surf on the beach is too heavy to admit of boats landing. A white trader resides at this bay.

Supplies.—Wood and good water may be obtained; also yams, a few fowls, and pigs.

Tides.—It is high water, full and change, in Selwyn Bay at 5h. 30m.; springs rise $4\frac{1}{4}$ feet.

Tidal streams.—The channel between Ugi and Bauro Islands is clear of dangers, and in it a westerly current is usually experienced during the southeast trade. Near the shores on each side the flood stream runs to the westward and the ebb to the eastward, and their strength is much influenced by the wind. Tide rips are met with off the southern point of Ugi Island and also near the Bauro Island coast.

Bio Island, lying 2 miles northwestward of Ugi, is a small flat coral island, 240 feet above high water, densely wooded, and fringed by a reef which is steep-to. It is uninhabited.

The channel between Bio and Ugi Islands is clear of dangers, but during the southeast trade there are generally tide rips in it.

Dangers.—A shoal with a depth of 2 fathoms over it is reported to lie off the northwest point of Bio Island at a distance of 1 mile from the shore.

A bank with about 10 fathoms water over it is reported to lie from 2 to 3 miles northwest by west of the north point of Bio Island.

Olu Malau or Three Sisters Islands, lying to the eastward of Ugi, extend in a north by west and opposite direction for a distance of 10 miles. They are of coral formation, flat, marshy, densely wooded, and uninhabited, but are occasionally visited by the Bauro Island fishermen; no good water can be procured.

Reefs.—Shallow patches extend about $\frac{1}{2}$ mile eastward and southwards of Malaualalo, the middle island, and there is a bank, with from 4 to 5 fathoms water over it, at $1\frac{1}{2}$ miles eastward of the south extreme of Malaupaina, the south island. The islands are fringed by reef to the distance of 400 to 1,000 yards.

Aliiti, the northern island, is 250 feet and Malaualalo and Malaupaina each 230 feet above high water.

Mosquito anchorage is situated off the entrance to a lagoon on the southwest side of Malaupaina Island, and is formed by the points of the land and a reef to seaward. Anchorage may be obtained in a depth of 21 fathoms, and there are two channels leading to it, both

being clear of dangers, the southern and broader being 300 yards wide.

Tides.—It is high water, full and change, at 3h. 25m.; springs rise from 3 to 4 feet, neaps 2 to 3 feet.

Tidal streams.—Off the entrances the tidal streams are felt at springs, the flood setting to the northward, the ebb to the southward.

Lark Shoal (lat. $9^{\circ} 59' S.$, long. $161^{\circ} 58' E.$), upon which 7 fathoms least water was found, extends 2 miles in a north-and-south direction, is 1 mile in width, and lies 25° distant 10 miles from the summit of the northernmost of Olu Malau Islands. The tidal streams in the vicinity run strongly, forming rips which would be dangerous for boats.

Ulawa Island (Contrariete), about 27 miles to the northeastward of Ugi Island, is about 8 miles in length in a north-and-south direction and 3 miles in breadth. It is 1,200 feet above high water and steep-to, with a good lee and smooth water along its western side during the southeast trade period.

This island is reported 5 miles eastward of its charted position.

Sutulahia anchorage.—There is temporary anchorage off Ngorangora, on the north coast. The best anchorage is off Sutulahia (Marata) on the western side. Here water can be obtained from the stream abreast, but it is not recommended for drinking purposes. Pigs are also obtainable from the villages. Matoi, the principal village, is $\frac{1}{2}$ mile northward of the stream, and is a mission station. Interpreters for Malaita Island may be obtained here.

Stewart Islands, charted about 90 miles northeast by eastward of Ulawa Island, were discovered in 1791. In 1907 the group was reported to be $4\frac{1}{2}$ miles to the southward and $13\frac{1}{2}$ miles to the eastward of the charted position. The group consists of five small islands, covered with coconut and other trees, and situated on a triangular reef about 16 miles in circumference. They form part of the British protectorate.

The islands are named Sikaiana, Faore, Manduiloto, Barena, and Matu avi.

The inhabitants, about 200 in number in 1897, are a robust race, of a light-brown color, hospitable and inoffensive. Many of them speak broken English, the result of their intercourse with whalers and traders.

Supplies.—No water can be obtained, but pigs, poultry, eggs, papaws, coconuts, bananas, and taro may be purchased for knives, calico, thread, tobacco, etc. The lagoon abounds with fish, but is dangerous to enter in boats near low water, the discharge of water from it attaining great velocity and assuming the character of rapids. The islands are visited every few months by a trading schooner, collecting bêche-de-mer and copra.

Sikaiana (lat. $8^{\circ} 22' S.$, long. $162^{\circ} 44' E.$), the easternmost and largest island, is situated at the eastern end of the reef, which is so steep-to that it may be approached in places to a distance of 200 yards. The island is about $1\frac{1}{4}$ miles in length and 150 feet above high water.

There is apparently no anchorage off Sikaiana. The British naval vessel *Wallaroo* rode by a wire hawser to a kedge laid on the reef.

Three-quarters of a mile to the westward of Sikaiana, on the northern edge of the reef, lies the central and smallest island of the group, the charted position of which is given, but the group is reported to lie considerably to the eastward of the position shown on the chart.

Faore, the second island in size, lies at the northwest end of the reef, and to the westward of it there is a boat passage to the lagoon. During the ebb tide this passage is difficult of access, and at low water has only a depth of 1 foot in it. It is, however, the only place in the reef where a boat can enter.

At the northwest side of the atoll there are two singular vase-shaped rocks, from 8 to 10 feet above high water, and covered with grass, brushwood, and a few coconut palms. These would appear to be the remains of a sixth island.

Mala (Malaita) Island lies about 25 miles northward of the western end of Bauro Island and is mountainous and thickly wooded. Its shore in places is low and lined with mangroves; in others it consists of dark coral a few feet above the sea, wooded to the water's edge. The land rises gradually from the shore to the ranges in the middle of the island, which vary in height from 600 feet to about 4,000 feet. Mount Kolovrat, its summit, is 4,275 feet above high water.

The coast line of this island is only approximately delineated. Mala and Maramasike Islands are reported to be situated 5 miles eastward of their charted positions.

Missions.—Mission stations are established at Wairoha (Onapusa) and Uhu, on the southwest coast; Mallu, on the north coast; Uras Cove and Aiyo Island on the east coast; with Saa on Maramasike.

Maramasike Island—Cape Zelee.—About 13 miles northward of Cape Zelee, its southern extreme, Mala Island is divided by a narrow channel, the southeastern part being known as Maramasike. Cape Zelee (Nialahau) is low and sloping, steep-to, with usually a tide rip off it.

Eastern side of Maramasike—Saa mission.—A white beach extends for a short distance northward from Cape Zelee, and there is another about $1\frac{1}{2}$ miles beyond, where the village of Saa is situated,

but landing is unsafe except in fine weather. This part of the island appears to be clear of outlying dangers.

At Saa there is a station of the Melanesian mission.

Mappo Harbor, situated about 8 miles northward of Cape Zelee, is about $\frac{1}{2}$ mile in width, 1 mile in length, and open to the southeast. There is apparently good anchorage in the center of the bay in from 5 to 7 fathoms water about $\frac{1}{2}$ mile from the beach.

Port Adam (Manaoto), on the eastern side of Maramasike, is about 4 miles in length, with an average width of $\frac{1}{2}$ mile. It is formed by Mary (Malau) and Halelei Islands and the low marshy shore fronting the high land. Mary and Halelei Islands are covered with coconut trees and easily distinguished from seaward, but the latter is only just above water at high spring tides. On each island there is a village. Tetarva and Wilanti Islands lie near the coast just northward of Port Adam, with Aulu Island a few miles farther northward. This group of islands is charted as the Greenwich Islands.

Entrances.—There are three entrances to this port, and with a strong sea breeze and an ebb tide there are heavy overfalls, having from seaward the appearance of breakers. The southern entrance, between the mainland and the south point of Halelei is about 800 yards wide, but the navigable portion is apparently reduced to about half that width.

Tataha, the middle entrance, and also the northern, are much wider, but the latter has in it some detached patches, which are, however, easily seen from aloft.

Anchorage.—There is secure anchorage within Mary Island in from 18 to 22 fathoms water, and also within Halelei Island, in depths of from 13 to 15 fathoms, but the latter space is rather confined, and near the small central island there are some detached coral patches. The British naval vessel *Curacoa* (1893) anchored about midway between the central point and the entrance, in a depth of 17 fathoms, with a good 200 yards swinging room round the anchor. There is no fresh water.

Natives.—The natives formerly were wild and treacherous. In 1873 they massacred the survivors, with one exception, from the wreck of a bark who had entered this harbor in their boat for the purpose of getting water. The exception alluded to, after much suffering from poisoned wounds, was rescued by the British naval vessel *Renard*. They are now more or less under the control of the Government.

Coast.—The coast to Maramasike Passage, at the north extreme of the island, is but little known.

West coast of Maramasike—Te Waina.—A little to the northwestward of Cape Zelee is a bight with several small islets. The

eastern is named Te Waina. Here the Saa natives communicate with vessels when it is too rough off their own place.

About $1\frac{1}{2}$ miles northwest of Te Waina there is a small opening in the coral, with a patch of white beach behind it, forming a snug boat cove known as Te Oroha. It may be known by the coconut trees, being the first grove northward of the Te Waina Bight. The coast here is steep-to.

Sualaha (Oroha) Cove (lat. $9^{\circ} 41' S.$, long. $161^{\circ} 25' E.$), 1 mile from Te Oroha, is another bight trending northeastward, where there is anchorage in from 5 to 15 fathoms water. The British naval vessel *Curacoa* (1893) anchored in the entrance of this small and sheltered cove in a depth of 17 fathoms. The light was not good or the vessel would have proceeded farther in.

Tides.—The rise of the tide is about 3 feet.

Suu Paina.—From Sualaha Cove the coast continues in a northwest by west direction for about 4 miles to the head of a bay facing southeast, named Suu Paina, or Great Harbor, said to afford anchorage in a depth of 5 fathoms; it did not, however, appear a safe one, being somewhat open to the trade wind. The western point of the bay is Cape Hartig, which may be known by its white beach.

Rararo Shoals.—Stretching southeastward of Cape Hartig nearly parallel to the coast are several patches of considerable extent, with depths of 2 fathoms or less over them in places. The southeastern extreme of these has a depth of 4 fathoms. Cape Zelee bearing northward of 81° leads southward of it, and the mountain, 2,133 feet above high water, on Mala open west of Maramasike 330° leads westward.

Ariel Harbor (lat. $9^{\circ} 41' S.$, long. $161^{\circ} 23' E.$).—About 1 mile northward of Cape Hartig is a white beach known as Teri ari, and a little farther on are the two Marau Islets, low, wooded, and situated on the same reef, with a shallow inlet beyond them named Tavaniahia and another beach to the northwestward.

Ariel Harbor, a confined anchorage within these islets, is about 600 yards in length, less than 200 yards in breadth in places, with depths of from 7 to 9 fathoms.

Tides.—It is high water, full and change, in Ariel Harbor at 3h.

Maramasike Passage.—From Ariel Harbor the coast trends northwest by north about 3 miles to the channel dividing Maramasike from Mala Island proper. Two white beaches on the Mala shore mark the southern entrance to this passage, known as Port Bougard. The passage is available for vessels of light draft under steam or with a fair wind.

In the northern entrance lies Sail Rock,¹ 25 feet above high water, with Pyramid Island, 300 feet high, between it and Maramasike

¹ Reported to lie $\frac{1}{2}$ mile farther south.

Island, and the low Annuta Islands on the reef to the westward. Several patches and banks, some doubtful, will be seen on the plan, one of $4\frac{1}{2}$ fathoms being in the fairway with Pyramid Island bearing 98° distant $1\frac{1}{2}$ miles. The British naval vessel *Royalist*, in 1891, drawing $16\frac{1}{2}$ feet water, entered from the northward, with a steam cutter ahead, and anchored in a depth of 4 fathoms, with the south extreme of Orulu Island bearing 305° and Totoanni-uhi about 223° .

The plan, which is but a sketch, shows a depth of not more than 2 fathoms in places near the middle of the passage.

The *Royalist*, entering by the southern mouth, proceeded up 7 miles to Hahupia Creek, off which she anchored in a depth of 7 fathoms, having carried that up as far as Pigeon Island, but a depth of 4 fathoms is charted about 800 yards southward of that island. Not less than 5 fathoms was found at 1 mile above the anchorage.

Tides.—It is high water, full and change, in Maramasike Passage at 7h., and the rise, which is about 5 feet, is very much influenced by the wind.

Tidal streams.—The flood stream apparently enters at each end of the passage, the streams meeting about 3 miles northward of Hahupia Creek.

Mala (Malaita) west coast—Lagoon Harbors.—From the southern mouth of Maramasike Passage the coast of Mala trends northwest by north for about 8 miles, and here begins a chain of islands near the shore, extending in a northwesterly direction for about 18 miles. Between these are canoe passages.

The shores of these islands are uniform, low, and wooded to the water's edge, all faced with the usual fringing reef. There are villages on the mainland abreast the several entrances.

Wairokai, the widest entrance, is 600 yards wide, and deep. Those southward of it are about 200 yards wide, but apparently deep.

A good mark for Wairokai entrance is the three mountain peaks lying close together, bearing 68° , also a deep gully which extends right down to the sandy beach 28° . The latter mark must not be mistaken for a gully to the southward which does not extend down to the beach, as it leads over a coral reef awash. The northern arm of the harbor is the most sheltered. Here there is anchorage apparently in about 13 fathoms water. At the head of the harbor a stream discharges, off which there is good anchorage in depths of from 8 to 15 fathoms about 200 yards distant.

Royalist Harbor (Waisisi) (lat. $9^\circ 19' S.$, long. $161^\circ 6' E.$) is situated near the northwest end of the chain of islands about $4\frac{1}{2}$ miles northwest by north of Wairokai. The entrance, about 2,400 yards in width, has a depth in mid-channel of 26 fathoms, and the harbor affords good and secure anchorage in depths of from 15 to 26 fathoms,

mud bottom, over a space about 800 yards in diameter. A stream runs into the harbor, and on the surrounding hills there are several villages.

A shoal with less than 1 fathom water over it lies about 200 yards eastward of Rapid Island, in the northwest part of the harbor.

Tides.—It is high water, full and change, in Royalist Harbor at 6h.; springs rise 6 feet (approximate).

Fulaha (Seaua), the bay westward of Royalist Harbor, is about 600 yards wide, and affords anchorage for small craft. There is a canoe channel leading to Royalist Harbor.

Mission—Wairoha (Onapusa).—This mission station is situated about 2 miles northwestward of Fulaha. It is the headquarters of the Queensland Kanaka Mission, and white missionaries are always in residence.

Shoal.—A shoal with a depth of 3 fathoms over it is charted as extending off Wairoha about $3\frac{1}{2}$ miles northward of Fulaha, but its existence is doubtful.

Coast.—From Wairoha the coast trends fairly straight to Alite Harbor, but it has not been examined. The hills above it are broken and rugged. Within are the three peaks near each other, before mentioned, backed by high mountains.

Alite and Langa Langa Harbors.—Alite Harbor, situated 16 miles northwest by north of Wairoha, is about $\frac{1}{2}$ mile in length by about the same in breadth, with a deep-water entrance about 300 yards wide. Near the center of the harbor there is a patch with from $4\frac{1}{2}$ to 7 fathoms water over it, affording anchorage, and with depths of from 9 to 12 fathoms inshore of it.

Alite Harbor—Coast.—The coast for a distance of 5 or 6 miles southward of this harbor is fringed with thickly wooded islands, between which and the mainland secure anchorage can be found for large vessels in depths of from 15 to 20 fathoms.

The largest of these islands, known as Bali, Amboambua, Taluli, and Kuaro, are separated from each other by deep channels.

Bina Harbor, situated 4 miles southward of Alite Harbor, is entered through a channel about $\frac{1}{4}$ mile broad between Amboambua and Taluli Islands. It is about 1 mile long in an east-northeasterly direction and 1,200 yards broad.

A rock awash is situated 200 yards westward of Bina Island, but otherwise the harbor appears free from dangers, affording anchorage in a depth of 16 fathoms at about 600 yards southward of the west extreme of Bina Island, and for small vessels in a depth of 10 fathoms between the east end of Bina Island and the mission village.

Lagoon.—Bina Harbor is connected with Alite Harbor by a lagoon situated eastward of Bali Island, in the southeastern part of which is a group of several islets, eastward of which anchorage can be obtained in a depth of 13 fathoms, mud bottom.

The lagoon is entered from the southward by the channel eastward of Bina Island, and from Alite Harbor through a channel about 300 yards broad.

The channel between Bali and Amboambua Islands is reported to be clear of dangers, but has not been examined.

Alite Island may be recognized by the yellow sand patch right in the center of it.

Langa Langa Harbor (lat. $8^{\circ} 58' S.$, long. $160^{\circ} 44' E.$) is separated from Alite by a narrow peninsula, with a channel connecting them between it and Alite Island, almost blocked by a shallow bank. The land is all low and wooded. The harbor is about a mile in length and also in breadth, with a deep entrance 300 yards wide close northward of Alite Island.

There are several islands in the harbor, the principal being Langa Langa. It contains a walled village, the chief of which spoke English.

It is reported (1902) that the name of this place is Bina and that Langa Langa is 3 or 4 miles to the northward, the village of that name being on an island just to the northward of an entrance from which the northwestern Alite Mountain bears 53° .

Supplies.—A few fowls, yams, and bananas are obtainable. There is frequent communications between Florida and this place, to barter for the shell money which is made here.

Dangers.—Brewis Patch lies about 600 yards southward of Bush Islet, which is immediately southward of Langa Langa. It is well southward of the fairway.

Gibson Reef lies westward of Gibson Island and northwestward of Langa Langa.

Anchorage may be obtained in about 15 fathoms water, over mud, about 400 yards eastward of Langa Langa Island.

Directions.—There is a break in the chain of mountains near these harbors, but to the northwestward the range again rises to an elevation of about 2,000 feet above high water. This peculiarity, with the high, irregular land to the southeastward and the low land between, forms a good mark for this part of the coast, useful to the navigator, as some 6 miles to the northwestward lies the Bejean Reef, which, however, may be seen from the masthead for some distance.

A vessel will be abreast Langa Langa entrance when the northern high land of Florida Island bears 263° . Northwest Alite Mountain, bearing 37° , also leads to the entrance.

To enter Langa Langa mid-channel should be kept and Bush Islet rounded at the distance of about 200 yards.

Tides.—It is high water, full and change, in Langa Langa at 6h.; springs rise 4 feet.

Bejean or Alite Reef, dry in places, breaks and is plainly visible. It is about 4 miles in length in a north-by-west and south-by-east direction and about $1\frac{1}{2}$ miles in breadth, its northwest extreme lying about 5 or 6 miles off the coast of Mala and 180° , nearly 10 miles from Cape Ritters.

The southern slope of the northwest Alite Mountain is said to be in line with the southeastern extreme of the reef when bearing 67° , and the same part of the mountain with the northwest angle of the reef when bearing 93° . The British naval vessel *Curacoa* (1893) passed between the reef and Mala, and reported the reef to be apparently some 3 miles northward of its charted position.

The shoal (E. D.) charted 5 miles south by east from Bejean Reef is said to be connected to it.

The British naval vessel *Cambrian*, in 1908, passed at a distance of 3 miles from this position without observing any indications of its existence.

Coast.—From Langa Langa Harbor the coast trends in a north by west direction, for about 15 miles, to Cape Ritters, with several bays between, below mentioned. It has from the offing much the same appearance as that of the land to the southeastward. Cape Ritters forms the outer point of the low-lying land, the coast beyond trending northeastward for 2 miles to Taylor Point, the western extreme of Coleridge Bay.

Auki Island Harbor (lat. $8^\circ 52' S.$, long. $160^\circ 49' E.$), situated about 6 miles northward of Langa Langa, is about 600 yards in diameter, with a depth of 13 fathoms in the center. The entrance between the reefs on either side is about 270 yards wide, but the navigable channel is reduced to about 150 yards by outlying patches. The depths in the entrance are 12 to 17 fathoms.

Auki Island lies within the southern reef, and Kaloka Island southward of it. The former is thickly populated. These islands are built up with coral blocks, giving them a fortified appearance, but in 1896 the natives were found to be friendly.

A pier extends about 70 yards southward from the north shore of the harbor. The police officer's house, white and conspicuous, is 162 feet above the sea on a hill about $\frac{1}{4}$ mile northeastward of the pier, and the magistrate's house, with flagstaff, is situated southward of the former.

Beacons.—Three beacons mark the edge of the reef on each side of the entrance, and three beacons are situated inside the edge of the reef on the northeast side of the harbor.

Light.—A light is shown occasionally from the flagstaff at the magistrate's house.

Directions.—The police officer's house in line with Entrance Point (north side of entrance channel), bearing 42° , leads to the entrance.

Supplies.—Fruit is obtainable, but the water is very brackish and not drinkable. There is a considerable local trade in shell money, which is made here.

Mission.—The Melanesian mission station from Feu is probably established at Auki.

Directions.—Coming from the southward, Auki entrance may be identified by Balekovu, a small mushroom-shaped islet on which are a few trees, situated on the edge of the fringing reef, $\frac{1}{2}$ mile southward of it; and from the northward by Auki Island, being the first of the islands fronting the shore. When entering, the course is about 50° in mid-channel between the reefs, and the anchorage is in about 13 fathoms water in the center of the harbor.

Tides.—It is high water, full and change, in Auki Island Harbor at 9h., and the rise is about 5 feet (approximate).

Feu and Koa Bays lie between Auki Harbor and Cape Ritters, both affording good anchorage during the southeast monsoon period. In Koa Bay a depth of 10 fathoms was obtained with the mouth of the stream 87° , and the southern extreme of the land 202° . It would also afford shelter from the northerly winds, as a reef extends off a point in the center of the bay under which a vessel might anchor.

Coleridge Bay, within Taylor Point, affords anchorage in from 10 to 15 fathoms water at 700 yards westward of the mouth of Otter River, within which distance the depths apparently decrease gradually toward the shore. The anchorage is smooth and sheltered from the ordinary trade winds.

The western shore is densely wooded, with trees about 100 feet high; the eastern side is apparently a sandy beach.

From its sheltered position, Coleridge Bay should be a good place for an occasional anchorage, or a watering place during the southeast trade winds. Few natives were seen, but the slopes of the ranges to the northward are cultivated.

Reef.—About 7 miles northward of Coleridge Bay is a reef near the shore.

Cape Astrolabe (lat. $8^{\circ} 20' S.$, long. $160^{\circ} 30' E.$).—From Coleridge Bay the coast trends northwestward for 25 miles to Cape Astrolabe, the northwest extreme of Mala Island. Off it there is a round islet named Bassakanna, with a deep channel between. The mainland is high and evenly rounded, with steeper shores than that to the southward of Coleridge Bay. The lower slopes are partly cultivated.

Some fishermen live on the island, and there is a village eastward of the cape.

From the cape the coast trends in a general easterly direction for about 4 miles, forming two bays, known as Mallu and Sio Harbors.

Bassakanna Islet is about $1\frac{1}{2}$ miles long in a northwesterly and southeasterly direction, and 1 mile across, and thickly wooded with trees about 160 feet high.

Mallu Harbor, immediately to the eastward of Cape Astrolabe, is formed by a prong of reef extending nearly a mile eastward from the northeast corner of False Cape Astrolabe. It is about a mile in length, and said to be not more than 200 yards in breadth. In the entrance there is a depth of 16 fathoms, decreasing to 10 and 12 fathoms in the fairway of the harbor. The space is very confined, and it should only be entered with the sun in a favorable position, unless the entrance is first buoyed.

The eastern reef at the entrance to this harbor is reported not to extend so far from the shore as supposed, and the western reef extends about 150 yards farther to the northeastward.

Water.—Watering is easy from the stream here which flows past Mallu village. The natives are all bushmen.

Sio Harbor, about 3 miles eastward of Mallu Harbor, is about 5 miles in length, 2 miles in breadth, and open to the northwestward, with deep water in the southern portion of it. A reef extends about a mile off the northern entrance point and fronts that shore to about half that distance. Reef extends from 400 to 600 yards off the southern shore. Several streams discharge into the bay, and between Davelo Creek and Boye Creek at its head there is about $\frac{1}{2}$ mile of shore free from reef. The shores are densely wooded on both sides with mangroves at the head, and there are several villages around the harbor, their positions being marked by coconut palms.

Water.—It is said that good water may be obtained from some of the creeks.

Anchorage may be obtained, in about 16 fathoms water, at about 1,200 yards from the center of the head of the bay. The bights in the reef on the southern side of the bay also afford anchorage.

Tides.—It is high water, full and change, in Sio Harbor at about 6h.: springs rise 6 feet.

Sio Bay lies between Bomboni or Sio Point and Manoba Island. It affords fair anchorage during the southeast monsoon, in from 11 to 20 fathoms of water, over mud, but as the water shoals quickly from 20 to 3 fathoms and less on the reef, it is necessary to anchor almost immediately after soundings are struck.

Shoal.—The master of the brig *Rio Lope* (1899) reports a shoal with an estimated length of 2 miles in a northwest and southeast direction, and an estimated depth of 4 fathoms, as being situated 6 miles northwest of Manoba Island, or in latitude $8^{\circ} 13' S.$, longitude

160° 38' E. The sea was seen breaking over it. No soundings were taken. The British naval vessel *Sealark*, in 1911, passed 6 miles off this position and saw the breakers.

Northeast coast.—**Manoba Island**, a low thickly wooded island, surrounded by coral reefs, is situated about 2 miles from the shore between Sio Bay and Cape Simson, the space between it and the shore being foul. Several islets stand on the reef between the eastern end of the island and the mainland.

Uras Cove (lat. 8° 26' S., long. 160° 45' E.), 5 miles southward of Manoba Island, is a bight in the reef, with depths of from 4 to 8 fathoms. It is used as a temporary anchorage by the traders as well as Atta Cove to the southward. There is a missionary station at Loloa (Uras) at the head of Uras Cove.

Ngora Fu Harbor, about 2 miles southward of Uras Cove, appears from the plan to be a small basin, about 400 yards in diameter, in the shore reef, protected by an outer reef, and entered from the northward. It has depths of from 6 to 18 fathoms, and the detail will be best seen by reference to the plan.

Tides.—It is high water, full and change, in Ngora Fu Harbor at 8h.; the range of tide is from 2 to 3 feet (approximate).

Atta Cove, situated about 5 miles southward of Uras Cove, affords temporary anchorage, in from 15 to 20 fathoms water, at 400 yards off the reef forming its eastern side.

Leili Island.—Cape Arsacides is about 14 miles southeastward of Atta Cove, and between it and a point 10 miles 177° of it a large bay is formed. Leili, a large low island of a horseshoe shape encircled by a reef, is situated nearly in the center of the bay.

Cape Arsacides is a low point gradually rising to a summit about 1,500 feet high at about 8 miles 334° from the cape. Leili and Leiliski are both densely wooded. The southwest ends of Leili and Leiliski are in line when bearing about 291°. The white cliff shown on the chart is fairly conspicuous from Leiliski.

Between Leili Island and the land, at the head of the bay, there are several reefs and shoal patches easily discernible from aloft when the sun is in a favorable position, but no dangers were seen from the masthead to the northward of the island.

Kwakwaru and Kwi Harbors lie about 3 miles westward of Leili Island, and may be identified by the two small islets, Kwi and Long Sila, on the reef southward of them.

Kwi Harbor is about $\frac{1}{2}$ mile in length and the same in breadth, with a deep entrance, 600 yards wide, between the reef forming Kwakwaru Harbor and that extending northeastward of Kwi Islet. The harbor is charted with depths of 10 to 15 fathoms near the fringing reefs, with deeper water toward the middle, where an uncharted shoal is reported to exist.

Kwakwaru Harbor, the northern arm of Kwi Harbor, affords shelter for small vessels in from 2 to 7 fathoms water, but a reef is situated near its center, with a narrow passage on either side leading to the head of the harbor. The entrance has depths of from 11 to 13 fathoms and is 300 yards in width, expanding to 600 yards within.

Anchorage.—The British naval vessel *Royalist* (1891) anchored in 6 fathoms water, with the conspicuous white cliff southward of Leili bearing 266°, Cape Arsacides 16°, and southern end of Leili 31°. The Basu River is a little southward of this anchorage.

Uru Island anchorage (lat. 8° 52' S., long. 161° 01' E.), about 7 miles to the southeastward of Kwi Harbor, affords anchorage southward of Uru Island in depths of from 7 to 18 fathoms. The size of the bay south of Uru Island is much exaggerated on the plan. Uru Island is artificially walled up on the east side. Reefs extend a considerable distance off the northwest point of Uru Bay.

Port Diamond (Sinarango), immediately southward of the southern point of the bay already mentioned, has general depths of from 20 to 30 fathoms, over soft mud, and is almost completely landlocked by wooded hills. The entrance is 670 yards wide, between two steep cliffs about 300 feet above high water, with fringed reef to about 100 yards. The western inner point has reef extending 400 yards, and from the eastern inner point another projects 500 yards, on which is situated Mark Islet, 75 feet above high water.

In the approach to Port Diamond, between the end of Mark Islet Reef and Two Tree Point, were seen, on the British naval vessel *Diamond* entering, two small detached rocks, but although carefully searched for during her stay they were not found. In entering this harbor vessels should have the sun in a favorable position and navigate by the eye.

Anchorage.—There is anchorage in Port Diamond, in 22 fathoms water, with Mark Island bearing 3° and Two Tree Point 273°. Narrow groups of reef, which are steep-to, extend from 200 to 300 yards off the southern shore of Port Diamond on either side of the anchorage given. There is also said to be anchorage in Tet Ghi Fau Bay (the northwestern part of Port Diamond) in depths of from 15 to 20 fathoms, at about 300 yards from the shore.

Kingfish Shoal is situated about 3 miles northeastward of the entrance to port Diamond, and an islet, the position of which is doubtful, about the same distance northward of the port. Neither of these was seen by the *Royalist* (1891), which vessel passed within a mile of the shore.

Double Bay lies about 6 miles southward of Port Diamond, and the entrance, upward of a mile wide, has two islets, standing on a reef, in the center. The depths in the channel southward of the islets are over 20 fathoms, while farther in there is anchorage, about $\frac{1}{4}$ mile

off the southern shore, in the same depth. The western head is shoal, but the northern part of the bay has about 28 fathoms water, with anchorage, under Panchingi Point, in depth of 24 fathoms. There are some villages around its shores, but the natives had a bad reputation in the year 1880.

Aiyo (Renny Island), about 5 miles southwestward of Double Bay, is about $\frac{3}{4}$ mile in length, in a northwest and southeast direction, low and wooded. A red rock, 70 feet above high water, is situated off the eastern side of the island.

Aiyo Harbor is a lagoon harbor formed between the reefs extending from the extremes of Aiyo Island toward the main island. It affords anchorage in its center in a depth of 16 fathoms, over mud, but the entrance is very narrow on account of the reef extending from the northern side about halfway across. A patch with a depth of 2 fathoms over it lies off the southwest point of the entrance. It should not be entered without buoying the channel.

Manna Kwoi Harbor, situated about 5 miles southward of Aiyo Island, is a small but well protected harbor, about 1 mile in length by $\frac{1}{2}$ mile in breadth. The entrance is about 600 yards wide, but the water is deep, and within it anchorage will be found in depths of from 10 to 20 fathoms, northwestward or southeastward, respectively, of the reef charted about $\frac{1}{2}$ mile from the village at its head. Reef extends off the points on both sides of the approach to Manna Kwoi.

Manna Kwoi village is situated on the southern side of the entrance. Off Bluff head, which forms the southern side of the approach, are the two Aielalli Islets, with coconut trees on them. The water is apparently shallow for some distance seaward of Bluff Head.

The Sisters (lat. $9^{\circ} 8' S.$, long. $161^{\circ} 16' E.$) are two small islands off the coast about 4 miles southward of Bluff Head. Within the northern, and between it and the northeast side of a point of the mainland, there is anchorage in about 18 fathoms water, used by the traders.

Tides.—It is high water, full and change, in North Sister anchorage at 7h.

A bank with from 5 to 6 fathoms water over it (*Royalist*, 1895) lies from $1\frac{1}{2}$ to 2 miles eastward of the Sisters. There may be less water, and the neighborhood should be avoided.

Deep Bay, lying just westward of the northern entrance to Marasike Passage is about 2 miles in length, 1 mile in breadth at the entrance between Mala Island and the reef surrounding Annuta Island. and about the same breadth within, where there are depths of from 10 to 15 fathoms off the village. At the head of the bay is a stream with shallow water for about $\frac{1}{2}$ mile off it.

Tides and tidal streams.—On the eastern coast of Mala the British naval vessel *Sparrow*, at about spring tides, found the flood stream setting to the southeastward and the ebb to the northwestward, and at that time (September) the night low water was the lowest, the rise being from 3 to 5 feet.

Indispensable Strait separates Mala from Ysabel, Florida, and Guadalcanar, the large islands to the westward.

It is about 120 miles in length, with a least breadth of about 20 miles, and apparently very deep throughout to within a few miles of the shores on either side. Bejean Reef, about 5 miles off the Mala shore, seems to be the principal offlying danger, though reefs extend some 10 miles southeastward of Florida, but parallel to the fairway.

Ramos and Gower Islands lie in its northern approach, with Bradley Reefs about 60 miles northeastward of the latter.

Nura Island is situated in the fairway of the southern part of the strait, between Mala and Guadalcanar, about 10 miles from the latter. It is about 80 feet above high water, covered with trees, and surrounded by reef to the distance of $\frac{1}{2}$ mile.

Ramos Island (lat. $8^{\circ} 16' S.$, long. $160^{\circ} 11' E.$) lies in the northern entrance about midway and 5 miles northward of a line joining Cape Astrolabe, on Mala Island, and Fulakora Point, on Ysabel. From a distance it makes as two islands, the highest part being to the westward. The island and the islets or rocks off it are densely wooded.

Banks.—Four small islets or rocks lie about $1\frac{1}{2}$ miles northwestward of it, with depths of from 10 to 12 fathoms apparently on the bank on which the rocks are situated; and the British naval vessel *Torch* (1900) passed over an extensive coral bank on which the least depth obtained was 10 fathoms, with the western islet, northwestward of Ramos, bearing 125° , distant about $2\frac{1}{2}$ miles.

A bank with 11 fathoms water, over sand and coral, is charted with Ramos Island bearing 8° , distant about $9\frac{1}{2}$ miles.

On the eastern part of the bank on which the rocks off the north part of Ramos Island are situated are shoals of 5 to 10 fathoms, and many banks with soundings of 10 to 17 fathoms, sand and coral, extend $12\frac{1}{2}$ miles eastward from Ramos Island.

Anchorage.—There is good anchorage during the southeast monsoon under the western side of Ramos in 7 fathoms water at $\frac{1}{2}$ mile distant from that island.

Gower (Inattendue) Island (lat. $7^{\circ} 56' S.$, long. $160^{\circ} 38' E.$), on which the British flag was hoisted on the visit of the naval vessel *Torch* in 1900, lies 24 miles northward of Cape Astrolabe. It is about 4 miles in length north-northwest and south-southeast and 2 miles

across, being widest at its northern end. It is of even outline and covered with trees from 150 to 170 feet high. A fringing reef surrounds the island and extends about $\frac{1}{2}$ mile off the northeast point, being quite narrow elsewhere. There are apparently no offlying dangers, and depths of upward of 100 fathoms were obtained 1 mile offshore.

The only sheltered anchorage is near the southwest end, where a bay runs in for about $\frac{1}{2}$ mile and is the same distance across. A sunken reef extends from shore to shore across the mouth of this bay, with the exception of a deep passage about 200 yards in width. Inside the reef the depths are from 6 to 3 fathoms, over sand and broken coral; outside, the water deepens rapidly to 50 fathoms. The passage is near the southwest point of the bay, which affords excellent shelter for a small vessel during the southeast monsoon. A village is situated in the northeast corner of the bay. A few natives visited the British naval vessel *Sealark* on the occasion of her visit, in dugout canoes, but brought no supplies, and did not seem at all anxious to trade. The position given is that of the southeast extreme of the island.

Bank (lat. $8^{\circ} 4' S.$, long. $160^{\circ} 42' E.$).—A bank, which appeared to be about 1 mile in extent, with a depth of 17 fathoms, but probably less, water, was reported in 1913 as lying about 9 miles southeastward from the southwest extreme of Gower Island. At the time the bank was discovered there was an easterly swell, but no break was seen.

The weather in Indispensable Strait at the season of the southeast trade is uncertain. Heavy squalls of wind and rain frequently pass over, with, at nighttime, intense darkness, and the wind shifting about several points so frequently as to make it trying in a sailing vessel to keep the sails trimmed or to know which tack to keep on. The water is generally smooth and a weatherly set may be expected.

Bradley Reefs, charted about 60 miles northward of Gower Island, were discovered on May 12, 1791.

The captain of the transport *Waaksamheyd* reports: "At 9 o'clock in the morning the man at the masthead discovered breakers on the starboard bow and not more than 6 miles distant. Soon after breakers were seen on the starboard quarter and on the beam, extending east-northeast and west-southwest, 5 leagues distant. At 11 breakers were seen on the larboard beam in different patches about 2 miles long and lying parallel to those on the starboard side. On this we brought to and sounded with 130 fathoms, but had no ground.

"This had the appearance of a dangerous cluster of shoals, for being situated in a climate where it seldom blows so strong as to raise a large sea, a ship might, in the night without a very good look-

out, be in great danger before they could be perceived; they appeared to be sand shoals, and very little below the surface. * * * The passage we sailed through is in latitude $6^{\circ} 52' S.$, longitude $161^{\circ} 6' E.$ ”

From a later determination the center of the passage above mentioned is (1886) considered to be in latitude $6^{\circ} 52' S.$, longitude $160^{\circ} 48' E.$ (or $2^{\circ} 12'$ in longitude westward from Stewart Islands, as originally stated.

The position formerly assigned to these dangers (about latitude $6^{\circ} 54' S.$, longitude $161^{\circ} 16' E.$) was passed over by the British naval vessel *Beagle* in 1875, and also by the Austrian frigate *Novara* in 1858 without any danger being seen. The latest assigned position has apparently not been examined.

Florida (Ngela) Island is the largest of a group of volcanic islands lying to the westward of Mala. It attains an elevation of about 1,400 feet, and is well wooded, with occasional grassy tracts bare of trees.

This variety of surface presented by sharp peaks and rounded hills, and apparent want of order in their features affords a pleasing contrast to some of the other islands.

It consists of two islands of a combined length of about 22 miles, in a west-northwest and opposite direction, separated by a narrow channel named Utuha. Olevuga, Buena Vista, and several small islands lie northwestward of Florida Island.

The villages are large and built chiefly on the slopes of the hills.

Tulagi Harbor, the principal port and seat of government of the British Solomon Islands protectorate, is situated about midway along the southern coast of Florida Island. The island is well populated, and the inhabitants are quiet but lazy.

The eastern portion of Florida Island lies some 13 miles northward of Guadalcanal Island, there being numerous shoal patches and reefs between them. Three deep channels run through this foul ground, namely, Ngela, Sealark, and Lengo Channels.

Westward of Tulagi Harbor there are no offlying dangers. The 100-fathom line runs parallel with the coast, about 3 miles offshore, the general depths across to the Guadalcanal coast being from 200 to 400 fathoms.

Mission.—The principal mission station is on Bungana Island, at the entrance to Baranago Harbor. Several Melanesian mission stations have been established along the coast, on the eastern part, at Belaga, Hongo, and Gaete.

Caution.—As only portions of the island have been examined, great care is necessary when navigating near its shores.

In the channel southward and southeastward of Florida Island there are a number of reefs and sandbanks, the positions of which are only approximate.

Asses Ears (Ta na tau) (lat. $9^{\circ} 8' S.$, long. $160^{\circ} 25' E.$) were formerly two rocks, 40 feet above high water, situated on a low shelving point, which forms the eastern end of Florida Island. One of these rocks has now fallen down. A reef which breaks extends about 400 yards offshore from the point. A shoal of $3\frac{1}{2}$ fathoms is situated $1\frac{1}{2}$ miles southward of Asses Ears.

Coast and off-lying dangers.—From Asses Ears the south coast of Florida Island trends $\frac{1}{2}$ miles southwest to Matumba Bay, and thence for 9 miles in a westerly direction to Baranago Harbor. Off this portion of the coast is Ngela Channel, which is deep, and safe with a good lookout, and runs between the shore and the Eastern and Western Fields, which consist of a large number of shoals and banks extending to a distance of 7 miles from the island.

Landmarks.—Sharp Peak, a remarkable bare conical hill, 693 feet high, is situated about 1 mile westward of the Asses Ears, and $\frac{1}{2}$ mile farther west is Cleverley Hill, 860 feet high, with a conspicuous tree on its summit. Other noticeable summits on Florida Island are Dome Mount, 1,110 feet; Mount Perry, 1,141 feet; Baranago Peak, 751 feet, with a large tree on its summit, overlooking Baranago Harbor; and Mount Barnett, 1,366 feet, about 3 miles northwestward of Tulagi Harbor.

East Island, 100 feet above high water and surrounded by a reef, is situated $2\frac{1}{2}$ miles northward of East Point. Several patches are charted between it and East Point, and also in the direction of Mboli Harbor to the westward.

Reefs.—A patch with a depth of $3\frac{1}{2}$ fathoms and probably less water over it is charted 7 miles 149° of the Asses Ears. Thence westward to Nugu and Bangana Islands it is probable many reefs exist.

Matumba Bay is an inlet nearly a mile in length, situated on the south coast of Florida, at $4\frac{1}{2}$ miles westward of Asses Ears. It is about 400 yards wide between the reefs fronting the points on either side of the entrance, with depths of from 8 to 10 fathoms in the anchorage. The plan shows a small but secure inner harbor with a depth of 7 fathoms. In the northern portion there is shelter for a small vessel with westerly winds, but a heavy sea runs in with a strong southeast trade. There is a trader's house and store in the northeast corner.

Outside Islets, three in number, are situated $\frac{1}{2}$ mile westward of Matumba Bay entrance. They are all very small, and are 90, 55, and 45 feet high, respectively.

Schooner Cove lies 4 miles west of Matumba Bay. It is used by local trading vessels in fine weather.

The coast is foul between Schooner Cove and Baranago Harbor to a distance of 1 mile offshore in places.

Black Rock, about 2 miles westward of Matumba Bay, is about 1 foot above high water, and between it and the shore there is another rock about 3 feet high. One-half mile westward of it is a small patch with a least depth of $3\frac{1}{2}$ fathoms over it at low water. Gaeta mission is on the main island northward of Black Rock.

Mandoliana Island lies midway between Matumba Bay and Baranago Harbor. It is about $\frac{3}{4}$ mile long and $\frac{1}{2}$ mile across at its widest part, the western end. The tops of the trees are 150 feet above high water, but in 1911 the island was being cleared for cultivation. Foul ground extends off the island from 400 to 800 yards, except on the northeastern side, where it is steep-to.

Mandoliana Island anchorage—Rocks.—A bank which within the 10-fathom curve is about $\frac{3}{4}$ mile long and of the same breadth is situated in the center of this anchorage.

Rocks with depths of $3\frac{1}{2}$ and $3\frac{3}{4}$ fathoms, respectively, are situated near the western and eastern edges of this bank.

Anchorage may be obtained during the southeast trade season off the northwest point of Mandoliana Island, but it is uncomfortable, owing to the strong tides setting between the island and the Florida coast.

At $1\frac{1}{2}$ miles westward of Mandoliana Island is a rock which dries 2 feet at low-water springs, lying $\frac{3}{4}$ mile off the Florida coast, and about 1 mile farther westward is Thaugama Island, 172 feet high, of small extent, and covered with trees. Flat Rock, 1 foot high, lies $\frac{1}{2}$ mile southwestward of Thaugama Island, and 670 yards farther in-shore is a reef which dries 2 feet at low-water springs.

Southward and southwestward from Mandoliana Island, at a distance of about $1\frac{1}{2}$ miles, are Edgell Bank and Norfolk Shoal. They are of small extent, with depths over them of 9 and 8 fathoms, respectively. Strong tide rips usually mark their positions.

Coast.—Between Mandoliana anchorage and Baranago Harbor the coast is much indented and is apparently foul. Hongo mission lies in one of the bights.

Nugu Island (Pari Sule), $5\frac{1}{2}$ miles southeastward from Mandoliana Island, lies on the southern edge of the extensive reefs, Eastern and Western Fields, and about midway between their extremes. It is about 1,350 yards in length east and west, and is a narrow wooded island covered with trees 130 feet high. It is nearly divided at its eastern end, where is a narrow isthmus of broken coral, over which the sea sometimes flows at high water. On the south side it is steep-to, but elsewhere is surrounded by foul ground; Jones Reef,

at the western end, extending $\frac{3}{4}$ mile to the northward, and Knowles Patches, with depths of $3\frac{3}{4}$ to 5 fathoms, coral, to the westward for a distance of $2\frac{1}{2}$ miles. Tide rips extend about 2 miles from the eastern extremity of the island. Irregular depths are found for a distance of about 7 miles westward and west-southwestward of Nugu.

A shoal with an estimated depth of 2 to 3 fathoms is situated 4 miles 64° from the east extreme of Nugu Island.

Hitchcock Shoal, with a least depth of $3\frac{1}{2}$ fathoms over it, is an isolated coral patch lying about $1\frac{1}{2}$ miles off the southeast extreme of Eastern Fields. Within the 10-fathom curve it is nearly 1 mile long northwest and southeast and $\frac{1}{2}$ mile across, the shoalest water being near its southeast edge.

Walker Rocks, of 4 and 5 fathoms, lie on the northern edge of the Western Fields, 4 to 5 miles west-northwestward of Nugu Island. They are usually marked by tide rips, but not by discoloration of the water.

The other numerous patches on Eastern and Western Fields are mostly visible by discoloration and always by tide rips. The usual depths over these are from 3 to 5 fathoms, coral bottom, and in order to avoid them the chart is the best guide.

Pari Pile.—This small wooded islet, 50 feet high to the tops of the trees, is situated 4 miles southwestward of Nugu Island at the western extremity of a narrow coral reef, 1 mile long, which is just covered at low water and is steep-to on the northern side.

The east side of Pari Pile is marked by a high and conspicuous coconut palm.

Sealark Reef, situated about 1 mile eastward of Pari Pile, with a deep channel between, is about $\frac{3}{4}$ mile in extent and of circular form, having a few uncovered bowlders on its western edge. The northern side is steep-to.

Reef.—A smaller but similar reef, having a low sand cay on its western extreme and also in the center, is situated about 600 yards southeastward of Sealark Reef.

A patch of 4 fathoms is situated 600 yards southward of this reef.

Depths.—Uneven depths, varying from 3 to 40 fathoms, are found for a distance of about 5 miles west-southwestward of Pari Pile Islet, the 10-fathom curve being situated about 1 mile westward of it.

Maxwell Shoal.—This shoal, with depths of $3\frac{1}{4}$ to 5 fathoms, is 600 yards long in an east-and-west direction and 200 yards broad. It is situated $2\frac{1}{2}$ miles west-southwestward of Pari Pile.

Ringdove Shoal, with a depth of 3 fathoms, is situated 4 miles west-southwestward of Pari Pile. It is $\frac{1}{4}$ mile long and 200 yards broad.

Two conspicuous houses situated at Penduffryn (between Balesuma and Berande Rivers), bearing 154° , leads between Ringdove Shoal and that of 5 fathoms at $1\frac{1}{2}$ miles northeastward of it.

The same houses bearing 129° lead southwestward of Ringdove Shoal.

Light.—A fixed white light is occasionally shown from these houses at night.

James Rock, a pinnacle with a depth of 7 fathoms, surrounded by depths of from 17 to 30 fathoms, is situated about a mile west-southwestward of Ringdove Shoal, at the western edge of the uneven ground extending from Pari Pile.

Maxwell Shoal, Ringdove Shoal, and James Rock are separated from each other by deep channels.

Directions for Ngela Channel.—From east to west: From a position 3 miles 76° of Asses Ears a 228° course will lead south of the $3\frac{1}{2}$ -fathom shoal situated $1\frac{1}{2}$ miles southward of Asses Ears, and north of a 4-fathom patch 2 miles east of Matumba Bay. Both of these dangers will probably be seen by their discoloration. When abreast of Matumba Bay, course may be altered to pass $\frac{3}{4}$ mile south of Mandoliana Island and north of Edgell Bank, and when up to Norfolk Shoal a 296° course will lead about 1 mile south of Bungana Island. The principal dangers in this channel for a vessel of heavy draft are the Walker Rocks, as they do not show by discoloration.

Sealark Channel.—This deep channel is situated between Nugu Island, with the shoals extending westward from it, and Pari Pile Islet, with the shoals in its vicinity.

The channel varies in breadth from 1 to $1\frac{1}{2}$ miles between the 100-fathom curve on either side.

Lengo Channel is the name applied to the passage between the danger line surrounding Nugu and Pari Pile Islands and the coast of Guadalcanal. The rivers which discharge into Lengo Channel from Guadalcanal discolor the water very much at times, giving the appearance of shoals, but as dangers exist there great care is necessary when navigating it.

This channel, situated between Pari Pile Islet with the adjacent reefs and Guadalcanal Island, is from 3 to 4 miles broad, with a depth of from 18 to 30 fathoms.

Hutchison Shoal, with a depth of 2 fathoms, is about $\frac{1}{2}$ mile in extent and circular in form. It is situated nearly 3 miles east-southeastward of Pari Pile Islet.

Simmonds Bank, usually marked by a strong tide rip, is of small extent and has depths of from 12 to 18 fathoms. It is situated in mid-channel at the eastern end of Lengo Channel.

Tidal streams.—The tidal streams set to the westward and eastward along the coasts of Florida and Guadalcanal Islands, following

the trend of the coast line and attaining a velocity of 2 knots at springs.

During the southeast monsoon, 1911 and 1912, the mean of the times of commencement of the east-going stream was 20 minutes before low water, and that of the west-going stream 40 minutes after high water, but these times were very irregular, with a range of 3 to 4 hours, being considerably affected by the local weather conditions.

The numerous shoals and irregularities in the bottom between Florida and Guadalcanal Islands cause strong tide rips, and with a strong wind against the stream the sea becomes dangerous for boats.

Shoals.—Koli Point, $3\frac{1}{2}$ miles westward of Gora, has a patch, with 5 fathoms water over it at about $\frac{1}{2}$ mile off. This shoal was unsuccessfully searched for in 1910 by the British naval vessel *Sealark*.

The dangers eastward and westward of these, being beyond Lengo Channel proper, are mentioned with the description of the coast of Guadalcanal.

Tidal streams.—The flood stream sets to the westward along the south coast of Florida. Eddies and tide rips are common between Florida and Guadalcanal and in Lengo Channel and present the appearance of shallow water.

Bungana Island (lat. $9^{\circ} 11' S.$, long. $160^{\circ} 13' E.$) lies on the southwest side of Baranago Harbor. It is $\frac{1}{2}$ mile long northwest and southeast, $\frac{1}{4}$ mile across, and 216 feet high. It may be recognized by Pukunambua (Thumb) Island, 78 feet above high water, off its western extreme. Patches lie in the channel between the island and the coast to the northward, and one of $2\frac{1}{2}$ fathoms lies nearly 500 yards westward of Tineti Point. The Melanesian mission have their headquarters here, with a church and school, and the island is being cleared for cultivation.

Light.—A fixed white light, elevated 198 feet above high water, and visible 5 miles, is shown near the center of the northern part of the island. For arc of visibility, see Light List.

Barango Harbor is about a mile in length, with from 20 to 30 fathoms water. At its head there is anchorage in depths of from 16 to 18 fathoms, over sand and mud, but only suitable for short craft. It is open to the southwestward and is not a desirable anchorage.

Baranago Harbor affords excellent shelter in the season of the southeast trade, but in the northwest season it is not a desirable anchorage.

Mission Channel, north of Bungana Island, leads to Baranago Harbor from the westward, but can only be used by vessels of moderate draft, and the tidal streams set strongly through.

Tides.—It is high water, full and change, at Bungana Island at 4h.; springs rise $3\frac{1}{2}$ feet, neaps $2\frac{1}{2}$ feet.

Utaha Harbor.—**Port Purvis (Utaha)**, a large, well-protected harbor on the southwest side of Florida Island, is the estuary of Utaha Passage, which divides Florida Island. It is surrounded by hills from 500 to 800 feet above high water, some of those to the southward being bare, while the others are densely wooded. The shore is lined with mangroves, broken here and there by small patches of sandy beach, and fringed by a reef.

The port is 4 miles in length, with an average breadth of about $\frac{3}{4}$ mile, and 600 yards wide in the entrance, between the reefs extending off Lyons and Plumer Points. There is no bottom at 13 fathoms until within about a mile of Pigeon Point, at its northeastern end. The point forms the western side of the entrance to Utaha Passage leading to Mboli and to sea to the northeastward. In the upper portion of the port, southward of Quoin Hill, the depths are from 8 to 12 fathoms, over mud, affording good anchorage.

Table Rock, lying about 300 yards off the northwest shore, is the only detached danger known in the port; on it are some heads that uncover at low water. This rock and the coral projecting off the points are easily distinguished with a favorable light.

The various bays in Port Purvis were found to afford good anchorage, but in some cases only near the head of them, and no villages were seen. Alligators, fish, and birds were numerous.

Depths.—The depths gradually decrease from 32 fathoms at the entrance to about 10 fathoms at the eastern end of the port, the bottom being mud.

Directions.—The northern entrance point to Port Purvis may be recognized by a bare patch of rock, which in the distance resembles a native house. The fairway of the entrance should be steered for when bearing about 121° according to the plan, passing between the reefs extending off the entrance point; thence keeping in mid-channel and following the line of no soundings shown thereon to the anchorage at the upper end.

Tides.—It is high water, full and change, in Port Purvis at 2h. 30m. (approximate).

Utaha Passage (lat. $9^{\circ} 03' S.$, long. $160^{\circ} 17' E.$), between Port Purvis and Mboli Harbor, is much used by small craft, but it is not recommended for vessels of above 15 feet draft until it has been surveyed. The British naval vessels *Renard* (1881), *Miranda*, and *Ringdove* (1895) proceeded from Port Purvis to Mboli through this passage.

It is about 4 miles long, from $\frac{1}{4}$ to $\frac{1}{2}$ mile wide, with two sharp turns near the northern end, and appears to be clear of dangers, with depths of 10 fathoms in mid-channel and 4 and 5 fathoms close to the mangroves on either side. There is a small shoal in the center with about

2½ fathoms water over it at about 1 mile from the northern entrance. A vessel will be approaching this shoal when a bare hill on the eastern side, near Mboli Harbor, opens off a point on the western side, and the course through the fairway becomes westward of 8°. The western shore should then be kept close aboard until past the bank.

The first bight in the passage on the western side, entering from the southward, is shallow, owing to the deposit from a large stream there. The curve of the channel, therefore, in this bight should be avoided.

A conspicuous village is situated on the eastern side about 3 miles from the southern entrance, and shortly after passing it a shoal, on which the depth is about 2½ fathoms, lies in the passage with a channel on either side of it, but that to the eastward is to be preferred as giving more room for a sharp turn occurring after passing it.

Entering Mboli Harbor from Utaha Passage, the best channel is eastward of the large reef, avoiding the detached reefs shown on the plan of Mboli Harbor.

Tidal streams.—The tidal streams run very strongly in the passage, having a velocity of from 3 to 4 knots in its northern part. The flood sets to the southward from Mboli Harbor and the streams meet off Pigeon Point at the southern entrance to the passage.

Mboli Harbor (Sara) is the northern mouth of Utaha Passage, and affords good shelter during southeast winds in depths of from 8 or 9 fathoms, but with north or northeast winds the anchorage for large vessels is exposed. A reef has been reported between the anchorage, as marked, and the large reef to the southward.

Small vessels can find shelter by passing eastward of the large reef which encumbers the mouth of the passage, anchoring off the mission, or proceeding farther southward, where there is complete shelter. The channel westward of the large reef is comparatively foul.

The British naval vessel *Torch* (1905) passed through the channel southeastward of the coral reef, marked with stone cairns, and found it too narrow for a vessel of that size.

Tree Islet, Black Rock, and some sand banks are situated on the reef, which covers at half flood, extending about ½ mile northwestward of the eastern point of the harbor.

A patch with 3½ fathoms water over it lies in the approach, with East Island bearing 123° and Tree Island 211°. Others are charted between it and East Island, as before mentioned. A shoal is charted in the bay westward of Mboli, and probably others exist there.

Mission.—There is a mission station, with a school, at Mboli village. The natives are friendly, but no supplies are obtainable.

Tides.—It is high water, full and change, in Mboli Harbor at 5h. 30m.; springs rise about 6 feet.

Hutchison Creek, northwestward of Port Purvis, is nearly 3 miles in length and $\frac{1}{2}$ mile across at the entrance. The depths for the first $1\frac{1}{2}$ miles inside are from 30 to 14 fathoms, mud. The creek then narrows to a width of about 200 yards.

Between Port Purvis and Hutchison Creek is another inlet, open to the southwestward. It runs in for about $1\frac{1}{2}$ miles and has depths of 27 to 10 fathoms, mud bottom.

Gavutu and Tulagi Harbors.—About 4 miles westward of the southern entrance to Port Purvis, on the south coast of Florida, are Gavutu and Tulagi Islands on either side of a deep bay, within which are secure anchorages.

A conspicuous house with red roof is situated at Halavo, eastern side of Gavutu Harbor.

Gavutu (lat. $9^{\circ} 06' 59''$ S., long. $160^{\circ} 11' 55''$ E.) and Tanambogo Islands, 148 and 121 feet above high water, respectively, are joined together by a stone causeway. Gavutu has been cleared of bush, and near its northern end is a trader's house, etc. Tanambogo is wooded and connected to Gaomi Island, northeastward of it, by a very shallow bank.

Settlement.—At the northern end of Gavutu is the trader's house. Considerable trade is carried on here by schooners with the Australian colonies.

Mission.—The mission station is at the native village of Halavo, on Florida Island, eastward of Gavutu Island.

Coal and supplies.—There is usually about 300 tons of coal on hand. There are two lighters, each holding about 25 tons.

Yams and sweet potatoes may be procured, and fish are plentiful in the harbor; tinned meats are also obtainable. Water, which is stored by the trader, is delivered alongside.

Pier.—The pier is 150 feet long. The British naval vessel *Sparrow*, lying alongside it, had depths of from 20 to 24 feet.

Buoy.—A buoy is moored to a coral head about 670 yards southeastward of the pier, and it was intended to place a dolphin on the stone causeway joining Gavutu and Tanambogo Islands.

Banks—Beacons.—A bank, nearly dry at low water, extends 800 yards southeastward and 400 yards eastward of Gavutu, and is marked by a black conical buoy. The eastern extreme of a shallow bank lies about 1,400 yards southward of Gavutu and is unmarked.

The eastern shore of the bay is formed by a portion of Florida Island, which is fronted by shallow water to the distance of 400 yards in places.

Anchorage.—There is good anchorage in from 18 or 20 fathoms water at 300 yards northeastward of the pier at the northern extreme of Gavutu.

Tides.—The tides are irregular and the approximate range is $3\frac{1}{2}$ feet. It is reported that the water is highest daily at 6 a. m. and 6 p. m. during the period of the southeast trade, and, during the north-west monsoon, at noon and midnight.

Tulagi Harbor lies northwestward of Gavutu and affords secure anchorage in depths of from 19 to 21 fathoms, over mud, in the bight on the northern side of Tulagi Island.

The island is nearly 2 miles in length in a northwest and southeast direction, about $\frac{1}{2}$ mile in breadth, and rises to a level ridge 350 feet above high water for nearly half its length.

Makambo Island, eastward of Tulagi, is to be planted with coconut palms (1908).

This island has two summits, the northwestern of which is 91 feet high, and the southeastern 96 feet high.

The island is cleared of trees except a few palms, and a jetty extends from the southwestern side.

A slip for small vessels is at the northwest end.

Leading lights and beacons.—Front: A fixed red light, elevated 29 feet above high water and visible 10 miles, is exhibited from a white triangular beacon erected on a reef 1,350 yards south-eastward of Makambo Island. It is intended to lower this light 6 feet.

Rear: A fixed white light, elevated 29 feet above high water and visible 10 miles in clear weather, is exhibited from a white triangular beacon erected on the reef skirting the mainland at $\frac{3}{4}$ mile east-north-eastward of Makambo Island.

These lights are about 1,150 yards apart, and when in line bear 9° . Unwatched.

A fixed white light is exhibited from a house with a red roof situated on the southeastern summit of Makambo Island, a fixed red light is shown from the outer end of the jetty on the southwestern side of the island, and a fixed green light from the pier eastward of the resident's house on Tulagi Island.

Communication.—A steamer of Burns, Philp & Co.'s line calls at Tulagi every six weeks with mails and stores from Sydney, and, after making the round of the Solomon Group, calls again on the return voyage to Australia.

The steamer employed by the above firm in their Gilbert and Marshall Island trade makes about six trips a year, and calls at Tulagi both going and coming. She carries no Solomon Island cargo, but conveys mails.

Messrs. Lever's steamer leaves Sydney direct for the Solomons about every 11 weeks. Under present arrangements there is direct communication from and to Sydney about 20 times during the year.

Resident.—The British deputy commissioner of the Solomon Islands protectorate resides on Tulagi Island, where also is a police station, etc. The resident's house is marked by a white flagstaff; the ridge in the vicinity is cleared of wood. Both the new and old residences have red roofs.

Port of entry.—Tulagi is the port of entry for the Solomon Islands, and there is a Government bonded warehouse.

Pier.—There is a landing pier in the cove eastward of the resident's house, with a depth of 3 feet at low water at its extreme.

Songonangona and Kokomtambu Islands, situated about $\frac{1}{2}$ mile to the southward of Tulagi Island, are together nearly 800 yards in length in a north by west and south by east direction, and joined by a narrow neck of sand about 100 yards in length.

Songonangona is 175 and Kokomtambu 173 feet above high water.

Songonangona Island is easily recognized from a distance, appearing as two islands close together.

Mbangai Island, 156 feet above high water and situated on a reef extending from the southwest side of Tulagi Island, is 740 yards from that island and 150 yards northwest from the northwest point of Kokomtambu. The channel between the 5-fathom curve lines off them is barely 300 yards in width.

Dangers.—**Southern Cross Reef** is about 1 mile long in a north-and-south direction and 400 yards wide, with less than 6 feet water over it in parts at its northern end and depths of $2\frac{3}{4}$ to 4 fathoms near its southern end. Its eastern edge is 800 yards from the reef off Gavutu Island and its western edge 1,300 yards off the reef at the southeast end of Tulagi.

There is apparently a deep-water channel from Gavutu Harbor northward of Gaomi Island and of Southern Cross Reef leading to Tulagi Harbor.

Sylvia Reef, about 300 yards in extent, with a least charted depth of 9 feet over it, is 550 yards southeastward of the southeast point of Tulagi, the channel between being 400 yards wide.

Shoal water extends for about 400 yards from the southeastern end of Mbangai Island.

Titus Shoal, on which the steamer *Titus* struck, is about 400 yards in extent, with a least depth of under 6 feet, from which the southeast point of Mbangai lies 53° distant 940 yards, and the south point of Songonangona 119° . A clump of coconut trees on Florida in line with the southeast point of Tulagi, bearing 46° , leads to the southward of it.

Freeman Reef is the extension of the shoal to the southwest by south on which Songonangona and Kokomtambu stand. It is nearly $\frac{1}{2}$ mile in length and from 200 to 300 yards in width.

Mohawk Bank, with a least charted depth of $4\frac{1}{2}$ fathoms over it, is off the southern end of Freeman Reef, from which it is separated by

a channel only 100 yards wide. It is about 450 yards long in a north-west and southeast direction.

Bayldon Shoals.—A shoal of coral, with a depth of 4 fathoms, is situated $1\frac{1}{2}$ miles west-southwestward of the south end of Songonangona Island. This shoal occupies the center of a bank which, within the 10-fathom curve, is 300 yards long in a northwest and southeast direction, and 200 yards broad, with deep water close around. From the shoal the resident commissioner's flagstaff on Tulagi Island bears 35° nearly 2 miles.

A coral head of 5 fathoms, with depths of 40 to 47 fathoms around, is situated $1\frac{1}{2}$ miles south-southwestward of the south extreme of Songonangona Island, and 1 mile southeastward of the above shoal.

The white triangular leading beacons, or lights at night, previously described, in line bearing 9° , lead 900 yards eastward of Songonangona Island and between Sylvia and Southern Cross Reefs.

Woodford Reef lies off the southern end of the Southern Cross Reef and has a least charted depth on it of 3 fathoms, from which the south point of Songonangona bears 280° 1,900 yards and the Gavutu observation spot 50° .

Anchorage.—The British naval vessel *Mohawk* (1899) found temporary anchorage on Freeman Reef, in 5 fathoms water, over coral, approaching it with the resident's house just open eastward of Mbangai Island, bearing 1° , and anchoring when the south extreme of Songonangona bore 43° . The least water found within 300 yards of the vessel was $4\frac{1}{4}$ fathoms, but the bottom was irregular.

There is also a bank with from 7 to 10 fathoms water about 400 yards westward of Sylvia Reef, where vessels often anchor.

The most sheltered anchorage is in the bight northward of Tulagi Island in depths of from 19 to 21 fathoms.

Directions.—A group of coconut trees on Florida Island in line with the southeast point of Tulagi, bearing 46° , leads southeastward of Titus Shoal, and in mid-channel between the 5-fathom curve lines of the shoals extending from Kokomtambu and Mbangai Islands, after passing which a course about 67° should lead between the shoals extending from the southeast point of Tulagi Island and Sylvia Reef.

Rainfall.—In the Solomon Group the annual rainfall, from 15 years' observations (1898–1912) at the Government station at Tulagi, averaged 118.445 inches. The wettest months were December, January, February, and March, their rainfall averaging 11.488, 12.775, 16.555, and 16.453 inches, respectively; the least rain, 5.938 inches, fell in June.

Coast.—The coast from Tulagi Island to Sandfly Passage, a distance of 6 miles, is high, wooded, and in general steep-to. The only

danger is a coral spit extending $\frac{1}{2}$ mile seaward of Boat Islet, which lies $1\frac{1}{2}$ miles westward of Tulagi Island.

Above Cliff Point, $\frac{1}{2}$ mile westward of Boat Islet, the coast range rises to Mount Harold, 1,038 feet high.

Horn Peak, the western extreme of Florida Island, at the entrance to Sandfly Passage, is 639 feet high and bare. Its summit is conspicuous from the southward and southeastward.

Sandfly or Ta ha Vula Passage (lat. $9^{\circ} 00' S.$, long. $160^{\circ} 06' E.$) separates Florida Island from Olevuga Island. It is 6 miles in length in a northeast and southwest direction and about $\frac{3}{4}$ mile wide at either end, the general depths in the navigable channel being from 45 fathoms in the southwestern entrance to under 10 fathoms near the northern end. The Florida is, in general, the higher shore of the passage, and is more indented than the Olevuga side.

The southwestern portion of Sandfly Passage is clear of danger, but farther eastward the soundings become irregular, and the tidal streams meeting the uneven bottom cause eddies and overfalls, especially in the narrowest part of the northern entrance, in which some dangerous rocks exist.

Landmarks.—The most conspicuous landmarks are Mount Olevuga, on the north side of the southwestern entrance, with a bold summit 1,043 feet high; Horn Peak, a bare, sharp summit 639 feet high on the opposite side of the same entrance, and Conical Hill (Harora), 703 feet high, about midway along the south shore of the passage. Mount Barnett (Po-ta), 1,366 feet, $2\frac{1}{2}$ miles away to the southeastward and the highest elevation on Florida Island, is also noticeable. There are many grassy slopes and summits interspersed among the thickly wooded heights surrounding the passage.

Shores.—From Native Point, under Mount Olevuga, the northwestern shore of the passage opens out into Laitonga Bay, a large bight, with Pigeon Island (M'biga), 83 feet high and of small extent, near its eastern side. Pigeon Island is situated on a coral reef almost dry at low water, which surrounds it to a distance of 200 to 600 yards, and foul ground extends $\frac{3}{4}$ mile southwestward and $\frac{1}{4}$ mile to the southward.

The shores of Laitonga Bay are fringed with a coral reef, with narrow spits extending offshore in places to a distance of 600 or 800 yards, but with a favorable light the outer edges of these are easily distinguished, and the bay has general depths of 30 to 40 fathoms, over sand and coral. At the northern end of the bay North Arm runs up in a northerly direction for a distance of about 1 mile, with depths of from 20 to 30 fathoms, mud, in mid-channel, the shore, which is mangrove swamp, being fringed with coral reefs.

Half a mile eastward of Pigeon Island is Hanipana Point, low and wooded, the passage between being shoal. From Hanipana Point the shore line trends north 2 miles to Nichols Point, when it turns away to the westward, forming the north coast of Olevuga Island.

On the Florida Island side of the Sandfly Passage the coast is much indented, and is fringed by a similar reef to that on the northwestern shore. Deep water, from 20 to 30 fathoms, is found in the bights at a moderate distance from the points of the fringing reef, the chart being the best guide when intending to pick up an anchorage.

Horn Point, the southwestern point of the passage, is low and cliffy and almost bare of trees. It rises quickly to Horn Peak, 639 feet high. About $\frac{3}{4}$ mile eastward of Horn Point is Rogers Rock, 80 feet high and joined by a sunken reef to the shore; thence the coast trends east-northeast to Green Point, beyond which is a bay with two islands in it close together. The northern one, Switzer Island, is 324 feet high and thickly wooded, the other, Gaskell Island, 239 feet high, has been cleared and a trader is established on it. A rock, 10 feet above high water, lies 300 yards southeastward from Switzer Island, near the edge of the fringing reef surrounding the island. From this bay the Florida Island coast trends northeastward, with another deep indentation, 2 miles to Harora Point, above which is Conical Hill, 703 feet high, thickly wooded and conspicuous.

Eastward of Conical Hill, Roderick Dhu Bay runs in for a distance of 1 mile, being $\frac{3}{4}$ mile across at the mouth between the fringing reefs. Its shores are thickly wooded and of moderate height.

Lark Point is the northern point of Roderick Dhu Bay. It rises to Hay Hill, a bare green elevation 530 feet high. Haycock Point, at the northeastern extreme of Sandfly Passage, is bare, and lies 1 mile northeastward of Lark Point, the edge of the fringing reef between being steep-to, but Mid Reef lies 400 yards off Lark Point.

Dangers and shoals.—Half a mile south of Pigeon Island is a 6-fathom patch, and 1,400 yards east-northeastward of the north point of Switzer Island is a rock with 2 fathoms over it at low-water springs.

Mid Reef is a dangerous reef nearly in mid-channel in the north entrance to Sandfly Passage. It is about 600 yards in length north and south within the 10-fathom curve, and 400 yards across, with general depths of 2 to 3 fathoms. At either end are rocky heads, the northern drying 3 feet and the southern being covered 2 feet at low-water springs. Mid Reef lies on a rocky ridge about 200 to 400 yards in width, which extends right across North Channel, with uneven depths of 5 to 20 fathoms. The overfalls and tide rips on it are occasionally heavy during the strength of the tidal streams.

Off Hanipana Point the 10-fathom curve extends to a distance of 500 yards, with very uneven bottom inside, which is usually marked

by a tide rip, and the coast of Olevuga Island generally from Hanipana Point to the northward, must be given a good berth.

Sealark Reefs, two in number, are situated about $\frac{1}{2}$ mile northward and northeastward from Nichols Point. The outermost one is 600 yards in length north-northeast and south-southwest, and from 200 to 400 yards across. There are several shoal heads on it with less than 6 feet of water at low-water springs. The inner reef is rather smaller, with similar depths over it. The lead gives no warning of approach, nor have the reefs been observed to break during the southeast trade season. A rock 10 feet high lies about $\frac{1}{2}$ mile northwestward of Sealark Reefs. The locality has not been examined.

Missions.—There are mission stations on the southeastern side of the entrance and on the middle point on the eastern side of the passage.

Anchorage.—Anchorage may be obtained anywhere in the bights out of the influence of the tidal streams, but the water is deep, 20 to 30 fathoms. The British naval vessel *Diamond* moored, head and stern, in a depth of 17 fathoms, over mud, off Nago village, in the bay southward of the conical hill. The approach to it is narrow but deep.

Entering this bay with the conical hill upon the port hand, the vessel passed between some coral reefs and patches, easily seen with the sun astern, and proceeded to the extreme head of the bay, and anchored.

Anchorage is also marked on a shoal spot southwestward of Pigeon Island.

Directions.—When the tidal stream is strong, as shown by the tide rips in either entrance, close attention must be paid to the steering, as there are many eddies caused by the uneven bottom. Vessels of heavy draft should not attempt the passage owing to the reefs in North Channel.

When entering from the westward, Conical Hill, which will be readily recognized, bearing 72° , leads between Horn and Native Points in about mid-channel. When past Rogers Rock steer 57° with Hay Hill ahead. This will lead about halfway between Harora Point and the uneven ground extending southeastward from Hanipana Point. When nearly abreast of Harora Point, alter quickly to 21° until past Mid Reef, when haul over more to the eastward to avoid Sealark Reefs and the other foul ground off the northeast coast of Olevuga Island.

In entering from the northward, Conical Hill is conspicuous on opening the passage. The only real danger to a vessel of moderate draft is Mid Reef, but a mid-channel course through North Channel leads nearly 400 yards westward of it.

Natives, etc.—There are many native villages on the shores of Sandfly Passage, but no supplies are obtainable. The people are friendly and peaceable. Alligators are said to be numerous in the

mangrove swamps and creeks, and occasionally enter the villages at night.

Tides and tidal streams.—It is high water, full and change, at Pigeon Island at about 4h. 20m.; springs rise $3\frac{1}{2}$ feet, neaps, $2\frac{1}{2}$ feet. The tides are irregular both as to time and height. During the season of the southeast trade the water frequently remains at practically the same level throughout daylight hours. The strength of the tidal streams is affected by the prevailing winds; they attain a rate of 2 to 3 knots at springs in the narrower channels. Strong tide rips are found off both entrances and near the shores of this passage.

North coast.—**Haycock Point** (lat. $8^{\circ} 57' S.$, long. $160^{\circ} 8' E.$) forms the northeast point of approach to Sandfly Passage, and is the northern extreme of Florida Island. Five miles eastward of it is Large Rock, situated close to the northern extreme of a peninsula about $2\frac{1}{2}$ miles in length. From Haycock Point the coast trends away to the southeastward, with a fringing reef extending 400 yards offshore, outside which the depths quickly deepen to 40 fathoms. In the approach to the bay between are Alligator and Pigeon Islands and Sail Rock. The latter, on which there are some coconut trees, is situated on the northern extreme of the reef extending northward of Alligator Island.

Vura anchorage is the bank, with depths of from 4 to 5 fathoms over it, situated about 600 yards southwestward of the southern extreme of Alligator Island. The bay in the north coast of Florida southward of it is apparently deep, with foul ground toward its head. Vura Village lies westward of this bay.

Olevuga Island, westward of Florida Island, is shaped like an anchor, with the crown to the northward. It is fringed by reef, apparently extending $\frac{1}{2}$ mile or more in places.

Anchorage.—There is a mission station on the western side of the island; off it there is anchorage for small craft, open to the westward, in from 15 to 20 fathoms water, over sand and mud, at about 150 yards from the reef which fringes the shore for about the same distance.

Westward of Olevuga are two islands 250 and 300 feet high, with Passage Rock, nearly covered at high water, between them. There are other islands northward of them.

Buena Vista (Vatilau) Island, lying northwestward of Olevuga and of Florida Island, is 1,050 feet above high water, of horse-shoe shape, about 4 miles in length, and uninhabited.

The passage between Buena Vista and the islands off Olevuga is about a mile wide, with Passage Rock, above mentioned, in its southern part. The British naval vessel *Emerald* passed northward of

this rock midway between it and the islet 250 feet high. The tide rips here are very strong and extend right across the channel.

Several smaller islands lie northward and westward of Buena Vista Island. North Islet, the westernmost islet, and Navotana, the south-westernmost, are each about 250 feet above high water. Hanisavo Harbor lies somewhere between the last mentioned and Buena Vista Island.

A reef, with tide rips, extends some distance northward of North Island.

Mission.—There is a mission station on the westernmost island, which is crescent shape, with a reef extending westward of it. There are coconut trees on the northern part, which is low. The southern extreme has two rocky hummocks.

Savo (Sesarga) Island is situated between the western extremes of Florida and Guadalcanal Islands. It is of circular form, 3 to 4 miles in diameter, and volcanic. The island has several peaks, the highest of which, almost in the center, is 1,673 feet above high water. The crater, about 1,500 yards across and some 250 feet deep, was visited by a party from the British naval vessel *Sealark* in 1912. The floor of the crater was found to be thickly vegetated, and there was an enormous mound about 200 feet high at its eastern side, composed of volcanic rock and lava. There are several old lava flows down the slopes of the peaks reaching the sea. There is a Roman Catholic mission station on the northwest side.

Depths.—The 100-fathom curve is nowhere more than 1,200 yards distant from the high-water line, and at 1 mile distance the depths are 300 fathoms, the bottom being chiefly composed of small volcanic stones. The rock charted off Koila Village at its southwest extreme has no existence.

There are no o-lying dangers, though the presence of tide rips might cause suspicion to a stranger.

Earthquakes are frequent, and during one which occurred several years ago a subsidence of part of the coast took place, and vessels now anchor where there was a village. Very severe shocks were experienced in January, 1899.

The island is covered with trees, among which are numerous villages, and the northern face is an uninterrupted steep white beach. It is frequented by trading vessels.

The inhabitants are numerous and energetic and appear to be living peaceably under recognized chiefs. They paddle off long distances in their canoes, which are some of the finest in the group, to trade with passing vessels, bringing pigs, yams, coconuts, bananas, maize, melons, eggs, etc.

Anchorage.—Anchorage may be obtained off the village of Koila, on the southwest side of the island, about 400 yards offshore, in 10

fathoms; also 300 yards offshore on the western side in 10 to 20 fathoms, off a village called Keela, where are some rocks above water fronting the beach and a white house. This is locally known as Black Rocks Anchorage.

Tidal streams.—The streams along the shores follow the trend of the coast line, running northward and southward with variable strength, from $\frac{1}{2}$ to $1\frac{1}{2}$ knots. Tide rips are formed where the streams meet off the north and south points of the island. In July, 1912, during fine settled weather, the north-going stream was found to commence about one hour after low water and the south-going stream at about high water by the shore.

Guadalcanal Island—General remarks.—Guadalcanal Island is of volcanic formation, about 80 miles in length in an east-and-west direction, with an average breadth of about 25 miles. It is reported 5 miles eastward of its chartered position. Towards its eastern portion it rises in lofty mountain masses which are frequently enveloped in clouds.

Landmarks.—Two remarkable conical mountains, near the west end of Guadalcanal Island are conspicuous when approaching from the southward. They are situated northward and northeastward of the head of Popau Harbor at distances of 3 miles and 9 miles, respectively.

Mount Popomanasiu or Lammas, near the center of the southern coast, has been ascertained to be 8,005 feet above high water. The Kavo Range, a few miles within Mount Popomanasiu, on the northern side of Ithina River Valley, is a few hundred feet higher.

Mount Popomanasiu (lat. $9^{\circ} 44' S.$, long. $160^{\circ} 00' E.$) was visited by the resident commissioner of the group early in the year 1899. The natives met with, although shy at first, were eventually most friendly, and this in a district only a few miles from where an expedition from the Austrian naval vessel *Albatross* was attacked with such unfortunate results in 1898.

Lions Head or Tatuve, about 5,500 feet above high water, is a broad-topped, steep-sided mountain standing out from the main chain in the central part of the island.

A somber forest growth covers the elevated eastern portion of the island. In the western half there is an extensive prairie district covered with high grass and dotted here and there with patches of forest. On the southern side the mountain slopes are only separated from the shore by a narrow fringe of lowland, but on the northern side a low, undulating tract descends gradually to the coast, and here large streams discharge their waters into the sea, the watershed being apparently near the southern part of the island.

Inhabitants.—The natives near the coast are fairly peaceable, though they should not be trusted by small parties. The more sav-

age tribes inland are constantly making raids on them, which no doubt the Government will in due time be able to suppress. Nearly all the trading villages are on the northern coast of the island. See preceding remarks and those on Tasimboko.

Marau Sound, at the eastern end of Guadalcanal, is formed by numerous islands and coral reefs, with many deep passages between them, through which the tidal streams run with considerable strength and irregularity. There are good anchorages on the western or Guadalcanal side of the sound, well sheltered in either monsoon. The hills, valleys, and islands of Marau Sound are all densely wooded with the high, dark trees common to these islands. See Settlement on Crawford Island.

Off-lying reefs.—Barrier reefs extend off the islands and the mainland, which, lying in a somewhat even curve, give a limit to the sound and form an excellent breakwater. These barrier reefs are generally steep-to on the outside and usually break, with the exception of the foul ground about East Island.

The only dangers charted beyond them are Taunu Shoal, about $\frac{3}{4}$ mile in extent, with many coral heads, and about 2 fathoms least water over it. It breaks at times and is situated about 1 mile eastward of Southeast Island. A patch with a depth of 5 fathoms over it lies with Square Islet bearing 260° , distant about 1 mile. Other dangers may exist.

Directions—Southeast entrance.—Approaching Marau Sound from the southeast, Marau Peak, 2,493 feet above high water, on Guadalcanal, is a good mark. As the sound is neared the high ridge of Malapa Island will be made out. The small islands begin to appear at a distance of 12 miles, and at 3 miles from the entrance the barrier reef and Pigeon Island Peak should be distinguished.

Unless the Emerald Rocks are properly marked no stranger should attempt the southeast entrance without the sun in a favorable position.

Pigeon Island Peak bearing 340° will lead up to the entrance which can easily be made out, as the barrier reef shows plainly. The east end of Pigeon Island, just open of Crawford Island, bearing 351° , leads through the southeast entrance. A vessel can pass on either side of Emerald Rocks, but the passage to the westward of them, and thence eastward of Ferguson Island and its reef, is to be preferred.

Ferguson Island Reef is steep-to, and shows well. Keep in mid-channel between Ferguson Island and Pigeon Island to avoid the shoal spit off Fintry Point; pass Jetty Point at a distance of 200 yards, and anchor in Danae Bay between Entrance Rock and the southern shore.

There is a passage between Ferguson Island and the main island, with a patch of 4 fathoms at its southern end. This passage is narrow but not difficult, as the reefs show well.

Northeast Entrance.—Entering by the northeast entrance, which is 1,400 yards wide, the leading mark is Pigeon Peak in line with the east extreme of Somayu Islet, bearing 185° , following the track recommended on the plan. The Beaver Shoals on the western side of the entrance, which sometimes break, are the chief dangers to be avoided, as the other reefs show well.

A rocky patch of small extent, with a least depth of 9 fathoms over it, lies midway in the northeast entrance and 500 yards east-southeastward of Beaver Shoals.

When the east extreme of East Island is in line with the north extreme of Malapa Island bearing about 126° , the vessel will be to the southward of the Beaver Shoals, and a 211° course can be steered for Harbor Hill, on Komachu Island, keeping the Beagle Island coast aboard until abreast of Renard Bay: when steer for the northwest end of Pigeon Island, which should be passed at a distance of about 200 yards to avoid Harbor Reef. Pass Jetty Point at a distance of 200 yards and anchor as convenient in Danae Bay.

Anchorage.—**Danae Bay** is the best anchorage in Marau Sound. The tidal streams are not inconveniently strong, and the holding ground is good in depths of from 9 to 15 fathoms, over dark sand.

Entrance Rock is dangerous, as it lies in the fairway of Danae Bay. It is about 10 feet in diameter, steep-to, and never uncovered.

A patch with a depth of 6 fathoms over it lies with the northeastern extreme of Beagle Island, bearing 11° , and the south point of Komachu Island 267° .

Harbor Reef, covered at high water, lies 300 yards off Harbor Point, in the northern approach to Danae Bay.

See Anchorage off the Settlement, Crawford Island.

Position (lat. $9^{\circ} 50' 30''$ S., long. $160^{\circ} 48' 25''$ E.).—Ferguson Island, in Marau Sound, was the observation spot.

Jetty.—There is a small stone jetty within Jetty Point, in Danae Bay, off the end of which is a depth of 8 fathoms.

Water.—Fresh water of good quality can be obtained from a creek situated about a mile westward of Entrance Rock.

Renard Bay, to the northward of Danae Bay, is not recommended, as the holding ground is bad and the depths irregular.

Conflict Bay (lat. $9^{\circ} 51'$ S., long. $160^{\circ} 48'$ E.), southward of Danae Bay, affords good anchorage in from 8 to 15 fathoms water. Conflict Bay has the advantage of fresh air, being open to the southeast trade, though it is probable that, with a strong wind from that direction, the sea caused might be inconvenient for boats.

Danae Pass connects Renard and Northwest Bays. It is 75 yards wide and has a sharp turn. There is no danger in the pass beyond the actual shores, which are hard coral. The British naval vessel *Danae* used it when proceeding out to the northwest, but it is not recommended to any vessel not acquainted with the locality.

Northwest Bay, lying to the westward of Beagle Island, is apparently clear of danger, except in the western part, where there are a couple of islands and a detached reef.

There is good anchorage in Northwest Bay to the northward of Danae Pass, in from 12 to 15 fathoms water, but as mangroves abound, it is probably unhealthful. In the northern approach, Round Island, 90 feet above high water and surrounded by a reef, lies in the fairway, with a channel on either side of it.

Cormorant Entrance.—A vessel can proceed into Marau Sound and up to Danae Bay by using Cormorant entrance, to the northward of Square Island, thence by Woodhouse Passage, to the southward of Malapa Island, passing on either side of Pigeon Island. The chief dangers to avoid in this route are a spit, with 2 fathoms water over it, extending 1,400 yards southeastward of East Island, and another spit, with the same depth over it, extending 600 yards 267° from Square Island, after passing which the remaining reefs show clearly.

Emu Entrance, to the southward of Square Island, should not be used until it has been further examined, as there are one or two shoals lying in it.

Wolverene Channel lies westward of the northeast entrance. The reefs of North and Round Islets in its approach are steep-to and show well, but the neighborhood of Reid Island should be avoided on account of its sunken dangers.

Purvis Point Reef shows plainly and should be kept close aboard, if using this channel, until past the Beaver Shoals. Wolverine Channel has many disadvantages, when compared with the broad and straight northeast entrance, and can not be recommended.

Tides.—It is high water, full and change, at about 10 p. m.; one tide in 24 hours; springs rise 3½ feet.

Traders state that the water is generally higher in the northwest monsoon, consequently the reefs, being more covered, are more difficult to see at that season.

Tidal streams.—The tidal streams in Marau Sound are strong and irregular, greatly depending on the season of the year. The streams run through the deep passages with a strength of from 1 to 4 knots, sometimes retaining the same directions for days together, and becomes more of the nature of a current.

Malapa Island and Anchorage.—Malapa Island, the largest island in the sound, is densely wooded, with a rounded summit 741

feet high. It forms a good mark for making Marau Sound from the northwestward, being visible 25 to 30 miles.

Malapa Bay, on the western side of the island, affords secure anchorage, out of the tidal streams, in about 25 fathoms, mud, and 400 to 600 yards off the shore reef.

Crawford Island—Settlement (lat. $9^{\circ} 49' S.$, long. $160^{\circ} 49' E.$).—Crawford Island lies close to the southwestern end of Malapa and is connected to it by reef.

Crawford Island has been completely cleared and cultivated by the Marau Co. There are houses, a store, and one or two white people stationed there; also a good landing pier for boats. On the southern end of the island is a trader's house.

Coal and supplies.—The company frequently has a small store of coal stacked, and coconuts, potatoes, coffee, and cocoa are planted on the island.

Anchorage.—Small craft moor in the space between Crawford and Malapa Islands. Depths of from 6 to 17 fathoms are charted on the northern side of Woodhouse Passage, close westward of Crawford Island; the water is much deeper elsewhere in this passage.

Pigeon Island lies between the southern end of Malapa and Komachu Islands. Its peak, 365 feet above high water, was formerly the best mark for both the northeast and southeast entrances to Marau Sound, it being readily recognized by the tall trees on its summit; but the peak is said to have lost the rugged appearance ascribed to it in the view on the plan.

Ayapu village is on the northwest point of Pigeon Island.

The flat coral islands scattered over the southeast part of Marau Sound and offlying on the northwest part are much alike, having a flat sandy base and thick covering of high trees. Ferguson, Robbe, and East Islands have palms.

Komachu Island is separated from Guadalcanal Island by a narrow passage. Traders report that the general depths in this passage are from 5 to 7 fathoms, with one or two shoal spots of 2 fathoms. It should not be used until it has been surveyed, as the discolored water prevents the shoal spots being easily seen.

Beagle Island has two conspicuous hills, named Halifax Hill and Nipple Peak. Halifax Hill, 730 feet, is conical and appears the same from all directions; Nipple Peak, 650 feet above high water, is double, but appears single when seen from the northward.

Wilson Islands are a cluster in the center of Marau Sound to the northward of Pigeon Island; they are surrounded by a reef, through which there is no passage.

Guadalcanal, south coast.—From Marau Sound the coast takes a west by south direction for about 16 miles to Cape Henslow, a bold point with a fringing reef; thence westward for about 50 miles to

Cape Hunter. Reefs are charted in places, but nothing is known of it beyond what is shown on the chart.

Bolonda village lies within a beach between two cliffy points about 9 miles eastward of Cape Hunter. Within it are several peaks. Mount Vatuvisa, a sharp peak, is 5,257 feet, and Mount Popomanasiu (Lammas), about 6 miles within the village, is 8,005 feet above high water before mentioned.

Ithina River lies eastward of the east extreme of Cape Hunter. The discharge of water from it when in flood must be great, as is evidenced by the large trees that strew the beaches on either side of its entrance. Boulders of coal have been noticed in this neighborhood.

Cape Hunter.—The coast here is covered with trees from the shore to the summit of the mountains; foul ground extends about $\frac{1}{2}$ mile off the cape.

Hunter Roadstead, lying immediately westward of the cape, affords anchorage in a depth of 12 fathoms, over fine sand, at $\frac{1}{2}$ mile westward of Veuvu village; but it is unsafe in onshore winds.

Aowawa Roadstead (lat. $9^{\circ} 45' S.$, long. $159^{\circ} 42' E.$), 6 miles northwestward of Hunter Roadstead, affords anchorage in 20 fathoms water, over sand, in the middle of the bay, $\frac{1}{2}$ mile west-northwestward of Aowawa Point, but the roadstead should be avoided during onshore winds. To the eastward of this point are two islets about 72 feet above high water. Tawata Point, on the western side of the roadstead, has a reef extending 600 yards off it.

Wanderer Bay lies about 4 miles northwestward of Aowawa Roadstead and is a mile broad by nearly the same deep. The mouth of Boyd Creek is situated in the southeastern part of the bay, and Serapin Islet, 40 feet above high water, lies off its northern point, which is 486 feet above high water and marks the entrance.

A shoal with $2\frac{1}{2}$ fathoms water over it lies about 300 yards southward of Serapin Islet.

Anchorage.—Denham Roadstead, in the southeast corner, affords the best anchorage, in a depth of 6 fathoms off Boyd Creek.

Cape Beaufort, about 4 miles northwestward of Serapin Islet, has a reef, with high rocks on it, extending about $\frac{1}{2}$ mile. Beaufort Bay, on its northern side, affords anchorage in the southern part in a depth of 10 fathoms over mud, and in the northern part in about 8 fathoms water off a village.

Popau Harbor, 7 miles northward of Cape Beaufort, is a circular basin about 1 mile in diameter, with anchorage in depths of from 8 to 12 fathoms. It affords both wood and water.

Flora Rock, with 9 feet water over it, lies near the middle of the harbor and 1,300 yards 25° from its southwest point. Sailing vessels entering with southeast winds should haul up close round the

reef off the southwest point and anchor as near the shore in the southeast part of the bay as practicable.

Coast—Dangers.—Tree Cay (Nogo Kiki), a wooded islet, lies a mile off West Cape and 2 miles northwestward of Popau Harbor.

From West Cape the coast trends northward for 10 miles to Cape Nagle, fronted by Came and Gazelle Shoals, Cheetah Reef, and other dangers to a distance of more than 4 miles. These and other patches, some of which break, will be seen on the chart.

Between Cape Nagle and Cape Esperance, the northern point of Guadalcanal bearing 199° , distant 5 miles, and Levelea Islet 295° , which there are depths of from 5 to 8 fathoms in the offing of Coughlan Harbor. This coast has not been examined.

A patch with 5 fathoms water lies with the western extreme of Guadalcanal bearing 199° , distant 5 miles, and Levelea Islet 295° .

Cheetah Shoals.—Cape Beaufort open of West Cape leads westward of these shoals, and Savo Island just open of the northwest extreme of Guadalcanal, bearing 58° , leads northward of them.

Cape Austen open of Cape Beaufort and in line with Tree Cay leads westward of all dangers off the west coast of Guadalcanal, which, however, should not, if possible, be approached within a distance of 6 miles.

Coughlan Harbor, which is only an open anchorage with good shelter during the southeast monsoon, lies 5 miles westward of Cape Esperance, the north point of Guadalcanal Island. It is partially protected from westerly weather by Sow and Pig Reefs, together about $\frac{3}{4}$ mile in length. These lie parallel with and $\frac{1}{2}$ mile distant from the shore and dry 2 to 3 feet at low water, with the exception of a cay of broken coral and sand 3 feet high near the eastern end of Sow Reef.

Howie Shoals, two detached patches with less than 6 feet over them at low water, lie $\frac{1}{2}$ mile northwestward of Sow and Pig Reefs. They break heavily in a westerly swell and are surrounded by deep water, the lead giving no warning of approach. Other shoals to the westward of Coughlan Harbor are Ellen Rock, of $4\frac{1}{2}$ fathoms, and Prince Shoal, with a least depth of 4 fathoms at low water, lying $1\frac{1}{4}$ miles 243° and $2\frac{1}{4}$ miles 283° , respectively, from the sand cay on Sow Reef; while about $1\frac{1}{2}$ miles westward of Prince Shoal is a shoal of 2 fathoms, which is apparently at the eastern end of a sunken barrier reef extending to the westward and southwestward, with discolored water, and lying from 3 to 5 miles off the west coast of Guadalcanal Island. At a distance of 1 mile westward of Sow Reef is a small patch with a least depth of 9 fathoms over it.

The best approach to Coughlan Harbor is from the northwestward, avoiding the shoals above mentioned, and passing about $\frac{1}{4}$ mile off the western end of Sow Reef. Anchorage is obtained southward and

southeastward of Sow Reef in 9 to 11 fathoms sand. Sow Reef is steep-to on that side, and the 5-fathom curve on the Guadalcanal side of the anchorage lies from 400 to 600 yards off the shore.

Mission.—Maromovo station of the Melanesian mission is situated on an elevated point of the coast about 1 mile southwestward of Coughlan Harbor. There is a hospital, the buildings of which are conspicuous from the eastward.

Coast.—Between Coughlan Harbor and Cape Esperance the coast is somewhat indented, with a fringing reef extending 400 to 600 yards off the points, on which are patches 3 to 6 feet high, and a few detached reefs lie offshore at a distance of from 800 to 1,000 yards. Paul Reef is the westernmost of the latter dangers, with 4 feet over it at low water. It lies 1 mile northeastward of Coughlan Harbor and $\frac{1}{2}$ mile offshore. Fish Reef, nearly awash at low water, lies 800 yards offshore 1 mile east of Paul Reef, and Mary Shoal, with 9 feet over it, is about $\frac{1}{2}$ mile farther east and a similar distance from the shore.

Mission.—At 1 mile westward of Cape Esperance is Veisali, a Roman Catholic (Marist) mission station, off which is anchorage for small vessels in southeasterly weather. A $4\frac{1}{2}$ -fathom bank lies $\frac{1}{2}$ mile seaward of this anchorage.

Good shelter may be obtained on this part of the coast during the prevalence of the southeast monsoon, and it must be remembered that there is no safe anchorage for a distance of 20 miles to the eastward of Cape Esperance. The reefs are easily avoided with a good light.

There are numerous villages on the beach between Coughlan Harbor and Cape Esperance, and the inhabitants are peaceable, being under the influence of the missions, but no supplies are obtainable.

Cape Esperance, the north point of Guadalcanal, has several high summits. Mount Esperance, $1\frac{1}{2}$ miles from the coast, rises to a height of 2,172 feet. Immediately inland from the cape is Veisali Peak, 1,185 feet high, which shows conspicuously along the north coast of Guadalcanal; on its northern slope is a remarkable triangular landslip. Mount Roundhead, 1,920 feet high, $\frac{1}{2}$ mile southeastward of Mount Esperance is also noticeable from the eastward. At about 6 miles southeastward of the cape is Mount Gallego, 3,560 feet high, at the foot of which is an extensive well-watered plain, reaching to the coast. Farther to the eastward the coast ranges are less elevated, and between Cape Esperance and Lunga Point the hills are not so densely wooded as is usually the case, there being considerable tracts of grassy slopes. On the coast are many native villages and coconut plantations, and the bush on the plain in front of the ranges is being gradually cleared.

Depths.—The 100-fathom curve rounds Cape Esperance at a distance of about 1 mile. Outside this line a vessel is clear of all danger. Between the cape and Lunga Point the 100-fathom curve lies from $\frac{1}{4}$ to 2 miles off the coast, the beach being especially steep to in the western portion.

North coast—Anchorages.—No safe anchorage is obtainable for vessels of any size in either monsoon until nearing Lunga Point, where good shelter will be found from southeasterly winds in Lunga Roads, about $\frac{1}{4}$ mile offshore, in 20 fathoms, sand.

Dangers.—Domma Reef, $\frac{1}{4}$ mile long northwest and southeast and 200 yards across, lies $\frac{1}{4}$ mile offshore about 6 miles southeastward of Cape Esperance. A cay of broken coral and sand near its center is 3 feet above high water. This cay is said by the traders to disappear in the northwest monsoon. There is a deep channel between the reef and the shore.

At $\frac{3}{4}$ mile northwestward of Domma Reef is a rocky patch with a least depth of 11 feet on it at low water, lying 400 yards offshore, with a deep channel between, and at $1\frac{1}{2}$ miles southeastward of Domma Reef is Kaufman Shoal, with 2 fathoms over it, of small extent, and surrounded by deep water. Neither of these sunken dangers break in the southeast monsoon. Abreast of Kaufman Shoal the 3-fathom line extends 200 to 400 yards offshore for a distance of $1\frac{1}{2}$ miles.

Point Cruz is a narrow projection about 400 yards long, situated 18 miles southeastward of Cape Esperance and 4 miles west-southwestward of Lunga Point. The trees on it are about 20 feet high. Its position has been identified with the Puerto de la Cruz of the Spanish discoverers in the year 1568.

There is anchorage for small craft with local knowledge on either side of the point, according to the direction of the wind.

About 4 miles south-southeastward of Point Cruz is Mount Austen, 1,514 feet high. It is conspicuous from seaward, with bare slopes and a clump of trees on the summit.

Lunga Roads lie between Point Cruz and Lunga Point, and anchorage may be obtained anywhere in southeast winds about 600 yards off the land.

A large coconut plantation called Kukum is situated here, the manager's house and other buildings being conspicuous from seaward.

Light.—From a flagstaff in front of the manager's house at Kukum an occasional fixed white light is exhibited.

Lunga Point is a rounded point at the mouth of the Tuumbuto River, and may be approached to a distance of 600 yards. The trees at the back of the point are 150 feet high.

A white house near a large village is situated about $3\frac{1}{2}$ miles eastward of Lunga Point.

Coast.—Between Lunga Point and Gorombusu (Korombusu) Point, situated about 27 miles to the eastward, the coast is formed by a narrow sandy beach backed by trees about 120 feet high, with occasional large coconut plantations, and intersected by several small streams.

An undulating plain extends from 4 to 7 miles from the coast to the foot of the inland mountains.

Numerous traders' houses and stores are situated on the coast, and there are a few small villages the inhabitants of which are friendly.

Anchorage.—During the southeast monsoon anchorage can be obtained off any part of this coast outside the 10-fathom curve, which is situated at distances of from 400 yards to $\frac{1}{2}$ mile from the shore. The bottom is mud and sand.

Lengo village, charted about 12 miles eastward of Cruz Point, has a bank with less than 3 fathoms water over it extending off for a distance of 500 yards. Off Koli Point, $1\frac{1}{4}$ miles farther eastward, is a patch with a depth of 5 fathoms over it, before mentioned with Lengo Channel.

Anchorage.—There is anchorage in 16 fathoms water, over mud, at about $\frac{1}{2}$ mile northwestward of Lengo village.

Rivers.—Several small rivers discharge in the coast between Lengo and Gera Island, which discolor the water during the rainy season, causing it to have the appearance of shoals in places, as mentioned with Lengo Channel. The principal are the Balesuna, Berande, Kombua, and the Aola.

Tetere or Gora village (lat. $9^{\circ} 24' 23''$ S., long. $160^{\circ} 13' 51''$ E.), lying 2 miles westward of the mouth of the Balesuna, is fronted by a bank, the 5-fathom curve being about 700 yards from the shore. The geographical position is that of the cross mentioned below as given by the officers of the Austrian cruiser *Leopard*.

A red granite cross has been erected at 38 yards from high-water mark at the eastern end of Tetere village. It is in memory of the Austrian expedition who lost their lives in 1896, but from its dark color is not a conspicuous mark.

A conspicuous white house with red roof is situated close westward of this village.

Anchorage may be obtained, in 7 fathoms water, about 800 yards off the village.

The British naval vessel *Rapid* (1897) anchored in a depth of 11 fathoms over sand off Tetere, with the west extreme of village bearing 177° and Togama Point 281° .

In 1911 the *Torch* anchored in 7 fathoms, with the extreme of Togama Point bearing 285° and conspicuous house with red roof 173° .

Vessels should approach the anchorage by bringing this house to bear 199°.

Berande (Penduffryn) Bay.—This small bay is situated between the mouths of Balesuma and Berande Rivers. It is easily recognized by two large conspicuous houses close together in front of a coconut plantation.

Shoals extend nearly 400 yards from the mouths of Balesuma and Berande Rivers, and boats can only enter these rivers at high water. The tidal streams run strongly in this bay.

Berande, the principal trading station of Messrs. Burns, Philp & Co., is situated $\frac{1}{2}$ mile eastward of the mouth of Balesuma River. It is a port of call for the mail steamer.

Light.—From a flagstaff at Berande a fixed white light is occasionally exhibited.

Anchorage.—During the southeast monsoon good anchorage is found in Berande Bay, in a depth of 10 fathoms, at about $\frac{1}{4}$ mile from the shore.

Tasimboko Bay.—This bay affords the best anchorage in the vicinity. The bottom is sand and mud.

From the point eastward of Tasimboko Bay the coast trends southeastward for 7 miles, forming a bay, at the eastern end of which is Korombusu Point. The sandy beach is closely backed by high trees.

Tasimboko is a large village 5 miles eastward of Tetere, and the anchorage off it is protected by the point to the eastward. The natives of this village appeared eager to trade, coming off in their canoes and making signs to stop off their village. They were, however, not to be trusted in 1897.

Anchorage.—The British naval vessel *Danae* (1879) anchored 2 miles northeastward of Tasimboko in a depth of 11 fathoms, over mud, $\frac{1}{4}$ mile offshore.

Coast.—From the point eastward of Tasimboko village the coast turns southeastward, forming a bay, in which is Ruavatu village. In the next bay southeastward lies Neal Island.

Between Tetere and Gorombusu (Korombusu) vessels should not approach the shore within a distance of from 1 to 2 miles. Many patches of discolored water and tide rips are seen.

Gorombusu (Korombusu) Point.—Shoals formed by shifting sands extend 600 yards from Gorombusu Point and Gorombusu River. Vessels should not approach the coast in this vicinity within a distance of $\frac{1}{2}$ mile.

From Gorombusu (Korombusu) Point the shore line turns abruptly to the south-southeastward for a distance of 4 miles to Aola Bay.

The Gorombusu (Korombusu) River runs out about $1\frac{1}{2}$ miles south-eastward of the point of that name. It has two mouths, the bars across which are constantly shifting. Boats can usually enter at high water. The 5-fathom curve lies about $\frac{1}{2}$ mile off this part of the coast, the depths gradually decreasing to the beach.

Appearance of the land.—About 13 miles south of Gorombusu (Korombusu) Point and 10 miles from the nearest part of the coast Mount Vatupusau rises to a height of 4,685 feet. It is quoin shaped with the slope to the westward, and has a double summit. An extensive plain reaches from its northern slopes to the coast. To the eastward of Mount Vatupusau lofty irregular mountain masses extend as far as Marau Sound, gradually approaching the northern coast of Guadalcanal Island. The highest summit lies 7 miles southeastward of Mount Vatupusau, and is elevated 6,348 feet above the sea; thence the heights gradually decrease to Marau Peak, 2,493 feet, at the eastern extreme of Guadalcanal. All these ranges are densely covered with forest, the higher elevations being usually obscured by clouds.

Neal (Vulelua) Island is a small island about 800 yards offshore, $2\frac{1}{4}$ miles southeastward of Gorombusu Point. It stands on a coral reef and is planted with coconut trees; near its center is a very conspicuous banyan tree, 144 feet high.

Dangers.—Weldon Reef 400 yards long northwest and southeast and about 200 yards in diameter; it dries 1 foot and lies about 400 yards northward of Neal Island, with a clear channel of 13 fathoms reported between.

Three dangerous shoals, which do not break during the southeast monsoon, lie to the eastward of Neal Island. The northernmost, Moresby Shoal, has two rocky heads of $1\frac{1}{4}$ and 2 fathoms, separated by a deep channel 100 yards wide. It is 800 yards in length north and south, 400 yards across, and is situated $1\frac{1}{4}$ miles northeastward of Neal Island, and therefore in the track of vessels passing along the coast. The 100-fathom curve lies about $\frac{1}{2}$ mile seaward of this danger. The south extreme of Rua Sura Islands bearing 108° leads $\frac{3}{4}$ mile northward.

Thrower Reef, with a least depth of 2 fathoms, is about 200 yards in extent inside the 10-fathom curve. It lies 64° 1,400 yards from the conspicuous tree on Neal Island.

Fairway Rock has 3 feet over it at low-water springs and lies 123° about 1,400 yards from Neal Island.

Caution.—The lead gives no warning of approach to these dangers, and they are not always marked by discolored water, as the silt out of Gorombusu (Korombusu) River and other streams, after rain, causes the whole sea in this neighborhood to become of a uniform mud color. A vertical danger angle of Neal Island tree is most

useful in passing these shoals; it is a valuable landmark for coasting vessels and is therefore likely to be preserved.

Vessels can pass either inside or outside of Neal Island, in either case keeping close to that island and Weldon Reef.

Anchorage may be obtained in the southeast monsoon in 6 fathoms under the western side of Neal Island, where there is good landing on a sandy beach. In fine weather vessels can anchor at about 300 yards southeastward of Neal Island.

The anchorage, in from 6 to 7 fathoms water, is about 200 yards westward of Neal Island.

To the southward, about midway between Neal and Gera Islands, is Hall Point, off which and to the southward patches of reef with rocks above water extend in places $\frac{1}{4}$ mile offshore.

Gera Island.—Gera or Kumbara Island is a low island, about 250 yards in length, off which all the trees, with the exception of two or three large ones and a few coconuts around the houses, have been cleared. It stands on a reef which extends more than 200 yards north-northwestward of it, and is separated from the shore reef of Guadalcanal by a 9-fathom channel 200 yards wide.

Aola village and River, fronted by a reef, are situated at the head of the bay, about $\frac{3}{4}$ mile westward of the island.

Aola Bay.—This bay, known also as Gera Island or Popes anchorage, affords excellent anchorage, except during northerly winds, in depths decreasing gradually from 18 to 3 fathoms, mud bottom.

Aola Bay can be recognized from a distance by a small white, sandy beach on Kumbara Island, the beaches in the vicinity being formed by black sand.

Aola River.—The mouth of Aola River lies 2 miles southward of Gorombusu (Korombusu) River; it is blocked by a sand bar with 3 feet over it at high water. Hall Point is $\frac{1}{4}$ mile to the northward. Patches of reef with rocks above water extend to $\frac{1}{4}$ mile off the coast, and there are numerous small villages along the beach.

Lights.—Two fixed white lights, vertical, are occasionally shown from a tall flagstaff on Gera Island.

Aola anchorages.—About 1 mile eastward of Aola River is Gera or Kumbara (Bara) Island, a trading station, at present the headquarters of the Malaita Co. Good anchorage is obtainable in Aola Bay, westward of Gera Island, during the southeast monsoon in 10 fathoms, mud, and on the east side of Gera Island in the northwest monsoon.

Aola Bay is the last really convenient anchorage on this coast until Marau Sound is reached, as, although there are several spots along the coast where temporary anchorage is obtainable, the beach is so steep-to, as a rule, that a vessel has to lie very close in to get a less depth than 20 fathoms.

Supplies.—Fowls and bullocks are sometimes obtainable.

Anchorage.—There is sheltered anchorage in depths of from 11 to 12 fathoms, over mud, at from 300 to 400 yards westward of the island, and there is a landing place at the southern end near the traders' huts.

The British naval vessel *Mohawk* (1899) anchored in 10 fathoms water, over mud, with the northern end of the island bearing 88° and the boat shed and house eastward of Jetty Point on the main island 180°.

Coast.—From Aola Bay the sandy coast line runs in an easterly direction for a distance of 5 miles to Susu Point. High trees come nearly down to high-water line. Kombito and Susu Rivers, besides smaller streams, discharge here. Boats can enter the rivers at high water.

Susu village is situated on the eastern point of the bay in which Gera Island lies, and between the village and Tauroto Cove, 5 miles southeastward, the shore is reported to be fronted by shoal water extending about 1 mile off.

Rua Sura Islands, three in number, lie 3 miles north-northeastward of Susu Point and are together about 2½ miles long in a west-northwest and east-southeast direction. The center island, Rua Sura, is by far the largest; it has been cleared and planted with coconut trees, which, in 1912, had not attained any height, but a few scattered trees from 100 to 120 feet high still remain.

Rua Kiki, the eastern island, is densely wooded, the tops of the trees being 140 feet high.

Rua Suli Island, to the westward, is merely a narrow strip of reef just above high water with trees 60 to 80 feet high growing on it.

All the islands have fringing reefs which are steep-to on their southern side. A sunken reef extends off the eastern side of Rua Kiki Island for a distance of 600 yards. The passages between the islands are only of use for boats.

Several reefs lie to the westward and northwestward of the group. Between the innermost and Rua Sura Island there is anchorage for a vessel not requiring more than 120 yards to swing in.

Northeast Reef, 2½ miles long northwest and southeast and about 200 yards across, dries in patches at its northern end. It has a general depth over it of less than 6 feet at low water and is separated from the north side of Rua Sura Islands by a channel 400 to 800 yards wide with irregular depths varying from 19 to 46 fathoms. The southeastern end of this channel, however, is almost closed by a shoal with a least depth of 2½ fathoms over it. Northeast Reef is steep-to on its seaward side; detached patches lie off its northwest end.

Northwest Reef lies ¼ mile north-northwestward of Rua Suli Island. It is of circular formation 600 to 800 yards in extent and

steep-to on all sides. Near its center is a bowlder which dries 3 feet at low water and at 400 yards off its eastern edge is a small rocky patch with a least depth of 6 fathoms. Lark Reef, about 400 yards in extent, is $\frac{1}{4}$ mile north of Rua Suli Island. A single bowlder on it dries 1 foot at low water.

Rocks with 6 feet of water on them lie 650 yards 356° and 700 yards 28° from the western extreme of Rua Sura.

Mid Reefs, which dry in patches, front the northern coast of Rua Sura Island, being separated from the shore reef, which extends off 600 yards by a channel from 100 to 400 yards wide. They are together nearly a mile in length and 200 yards across at the widest part.

Mission.—The Marist Fathers (French) have established a mission station on the western end of Rua Sura, and the houses are conspicuous. There is a large school connected with the mission.

Anchorage.—Between the western end of Mid Reefs and the shore reef anchorage may be obtained during the southeast monsoon in 12 fathoms, sand and coral, but the space is confined, and offlying patches of reef exist nearly 200 yards from the shore reef.

There is also anchorage in the southeast season in 30 fathoms, sand and coral, about 300 yards westward of Mid Reefs and 400 yards 39° from the western extreme of Rua Suli Island.

At the eastern end of Rua Sura Island the shore reef incloses a lagoon with a narrow entrance from the sea. The southern portion of this is about $\frac{1}{4}$ mile long and 200 yards across, with depths of 4 to 9 fathoms, and forms an excellent boat harbor in either monsoon.

Tides.—It is high water, full and change, at Rua Sura Islands anchorage at 4h. 20m. (irregular); springs rise $3\frac{1}{2}$ feet, neaps $2\frac{1}{2}$ feet.

Observation spot.—At the western extreme of Rua Suli Island a post has been driven in, to which is fixed a brass plate marked "Rua Δ , 20 feet 270° from this post, H. M. S. *Sealark*, 1910–11–12."

Nura Island is situated on a reef 9 miles eastward of Rua Sura Islands. It is 1,400 yards long in a north-northeast and south-southwest direction and 400 yards across at its widest part. Thick bush with trees 150 feet high cover the island, the center of which is below high-water level and is probably flooded by the sea in the northwest season. The reef extends in places to nearly $\frac{1}{2}$ mile from high-water line and dries 2 to 3 feet, with bowlders on the outer edge.

Natives occasionally visit the island when passing between Malaita and Guadalcanal Islands in their canoes.

Anchorage.—Good shelter was obtained by the British naval vessel *Sealark* (August and September, 1912) in 30 fathoms, sand and coral, northwestward of the south extreme of the island and about 400 yards from the shore reef, the wind being fresh to strong from the southeastward.

Tide rips.—Strong tide rips are said to exist at times to the south-eastward of Nura Island. They were not seen by the British naval vessel *Sealark* during the survey, but the bottom is very uneven in that direction for a distance of 8 miles, the depth varying from 80 to 300 fathoms.

Coast.—At Susu Point the coast turns to the southeastward. Many streams run out and small villages are frequent. Rere Point, $2\frac{1}{2}$ miles from Susu Point, projects $\frac{1}{2}$ mile from the coast, and there is good shelter to the westward of it for small craft during the south-east monsoon. Traders report that there is also anchorage, in the northwest season, eastward of the point and inside a reef of sunken rocks which extends in a south-southeast direction from the beach, and affords protection from the westerly swell. The mouth of Rere River lies $\frac{1}{2}$ mile westward of the point.

Talatoa (Tauruto) Islet is situated 2 miles southeastward of Rere Point and $\frac{1}{2}$ mile offshore. It is a low islet on a coral reef and has a conspicuous banyan tree near its center, 130 feet high. The reef is surrounded by deep water, and the 100-fathom curve is only 400 yards to seaward.

Pope Rock, with 9 feet over it, lies $\frac{1}{2}$ mile east-southeastward of Talatoa (Tauruto) Islet. It is of small extent, rises abruptly from a depth of 20 to 30 fathoms, and its position is usually plainly indicated by discolored water.

Coast.—The coast line turns abruptly to the southward at a distance of $2\frac{1}{2}$ miles south-southeastward of Talatoa Islet, forming Kau Kau Bay. Here a considerable stream, called Simiu River, enters the sea, but is not accessible to boats. From Simiu River on the west to Vate-o Point on the east side of Kau Kau Bay is a distance of 7 miles by the beach. Three rivers discharge on the south shore of the bay, Bo-o, Singalia, and Kau Kau Rivers. Their mouths are obstructed by sand bars, except after heavy rains. There is a considerable coconut cultivation on the southern shores of the bay.

Anchorage.—Kau Kau Bay is deep, but anchorage may be obtained off a trader's house in the southeastern corner, just to the westward of Kau Kau River, in 27 fathoms, mud, about 400 yards offshore.

Coast.—From Vate-o Point the coast trends east 6 miles to Marau Sound. It is very steep-to, the 100-fathom curve approaching within $\frac{1}{2}$ mile of the beach in places. High trees come right down to high-water line except near Marau Sound, where there is a narrow belt of mangroves. An indentation of the coast at Korai plantation forms an anchorage for small vessels. In the western approach to Marau Sound are three islets lying 600 to 800 yards offshore. The western one, Pari Island, is very small in extent, while the others, Symons

and North Islands, are each about 1 mile in circumference; all are covered with trees from 100 to 125 feet in height, and stand on coral reefs surrounded by deep water.

Current.—In August the current was found setting to the southwestward in the channel between Guadalcanal and Pavuvu Islands, attaining a velocity of about 1 knot.

Pavuvu (Russell) Islands.—This group, lying from 20 to 40 miles northwest by north of Guadalcanal, extends 20 miles in an east-and-west direction and 12 miles north and south, and consists of two principal islands and a number of islets scattered around them, having, as a rule, deep water close-to. Messrs. Lever Bros. have become the proprietors of the larger portion of the group.

This group of islands is reported to be situated about 5 miles eastward of their charted position. Large coconue plantations are established on this group, and there is a considerable export of timber.

The largest island is about 1,600 feet above high water, with Sunlight Channel, a deep passage, between it and the island eastward of it. The northern part of the group is bordered by a barrier reef, having numerous islets from 10 to 50 feet above high water upon it, nearly all of which are covered with vegetation. In the center of the barrier reef there is a deep passage between Itamati and Ellavoline Islets. Inside the barrier there are several coral patches, some of considerable extent, all of which, however, can be discerned from aloft.

Pepesala (Paddy) Bay.—This bay, situated at the northern end of Pavuvu Island, affords good sheltered anchorage at the head in a depth of 25 fathoms at 300 yards from the shore reef.

The western side of the bay is formed by Karamulla Island, which is densely wooded and 90 feet high, and Batata Island. Both of these islands stand on the same reef, which is nearly connected at its southern extremity with Pepesala Point, on the west side of the bay.

The eastern side of the bay is formed by Kobiloko (Yam) Island, which is bold, wooded, and 100 feet high, having some islets extending southward from it with a narrow but deep passage between them and Kaylan Point.

Several houses are erected at the head of the bay, and the shore is fringed by reefs $\frac{1}{4}$ mile broad.

Bycee Island is bold and 100 feet high. Between the eastern side by Bycee Island and Karamulla Island is situated a deep inlet affording no anchorage.

Banika Island, 400 feet high, is separated from Pavuvu Island by Sunlight Channel, which is narrow and deep.

Anchorage (lat. $9^{\circ} 04' S.$, long. $159^{\circ} 09' E.$).—The British surveying schooner *Renard* (1880) anchored, in 15 fathoms water, in a confined position for even a small vessel, at the entrance to Renard Sound, situated on the northeastern side of the easternmost large island, and obtained good fresh water from a stream $1\frac{1}{2}$ miles up the sound.

The trading vessels usually anchor off Moko Island, situated in the northern part of Sunlight Channel. Anchorage was also found in a small inlet, southward of Moko Island, on the eastern shore, in a depth of 20 fathoms, over mud and coral, with just room to swing. The channel westward of the island just within the southern entrance is foul. Trading vessels also anchor in the bight southeastward of Nono Island, which is situated in the deep bay on the northeast side of the large island.

No anchorage could be found by the British naval vessel *Diamond* (1882) in Paddy Bay, south of Kobiloko Island, nor on the northern side of the group, southeast of Bryce Island.

Anonyma Cove, at the head of West Bay, affords anchorage in a depth of 18 fathoms, over mud. The British naval vessel *Curacoa* (1883) entered this cove from the westward, passing between Leru and Money Islands, the shores on either side of which were found to be steep-to; thence across West Bay, and up the southeastern arm to the head of the cove, which is 500 yards at its entrance, with a fringing reef 100 yards off each shore. Brewis Inlet leads southward from it. The anchorage was rather confined.

Brewis Inlet (lat. $9^{\circ} 02' S.$, long. $159^{\circ} 04' E.$) was traced for 1 mile and was found to open to a shallow lagoon, with depths of from 1 to 3 fathoms and trending northeastward, possibly reaching the sea again in that direction.

Natives.—The group appeared to be thinly inhabited by a peaceable and keen trading people, most of whom speak a little English, and were well provided with European goods.

Supplies.—Figs, yams, pineapples, limes, mangoes, bananas, coconuts, and spinach can be obtained.

Shoals.—The master of the schooner *Lavinia* (1873) reports a shoal on which the sea breaks only in heavy weather lying with the summit of Cape Marsh, the western extreme of the Pavuvu Islands, bearing 1° , distant about 4 miles.

A shoal, said to be 100 yards in extent, with an estimated depth of 5 fathoms, is reported to lie with the western extreme of Allacon Islet, bearing 14° , distant $1\frac{1}{2}$ miles. A shoal reported by D'Entrecasteaux lies apparently between these.

Victoria Shoal, on which a depth of 9 fathoms was obtained, lies with Cape Marsh bearing 354° , distant 5.7 miles, and the southern

extreme of Allacon Island 78°. It is about 200 yards in extent and appears to have much less water than the depth above given on its southern edge.

A reported shoal is charted about 8 miles westward of Cape Bola, the southwest end of the largest Pavuvu Island.

Caution is necessary when navigating in this neighborhood.

Murray Island (Buraku) is a volcanic island, 1,000 feet above high water, lying about 18 miles westward of the Pavuvu Islands, by the natives of which it is sometimes visited when on their trading voyages to New Georgia, and who report that there are no reefs off it. It is fringed with coral, and the only landing place is on a small beach upon the northwestern side. On the southwest side is a slight bend in the coast, off the points of which reefs extend nearly 200 yards.

When seen from the northward the island resembles a truncated cone. It is uninhabited, but said to abound in pigs.

Brougham Shoal, about 21 miles westward of Murray Island, is described with New Georgia.

CHAPTER XII.

SOLOMON ISLANDS—CENTRAL AND WESTERN ISLANDS OF THE GROUP.

New Georgia Group—General remarks.—The New Georgia Group consists of one large island and several smaller islands or groups of islands, covering a space of about 130 miles in length in a northwest and southeast direction by about 40 miles in breadth.

The larger islands are of volcanic origin and have numerous symmetrical cones, the highest of which are often obscured by clouds and which range from 3,000 to over 5,000 feet in height.

Natives.—The inhabitants are of a mixed race, principally Papuan and Negroid, usually of a dark brown, with a frizzy hair. In physique they are small but lithe and active. They are in a completely savage condition, and caution is necessary in dealing with them. Their houses and canoes are well built.

The natives are of an indolent disposition, rendering supplies of vegetables to ships limited and uncertain. They rarely eat meat and keep but few pigs, which they will seldom sell. No estimate of the number of the population can be made, owing to the numbers living back in the bush, but there are probably not more than 3,500 or 4,000 in the whole group, most of whom live around Rubiana Lagoon. Wana Wana and Tetipari are uninhabited and Kulambangra very nearly so.

Traders.—There are generally about half a dozen white traders living in the group. Three or more own islets in the Rubiana Lagoon, where they have built houses; two or more are in the Marovo Lagoon; and there are others, not living actually on shore but cruising for copra, etc., in their own schooners.

Protectorate.—This group and the following islands, inclusive of Choiseul, form part of the British protectorate.

Winds.—Between July and January the winds in New Georgia are light and rather variable; neither a true trade wind nor monsoon can be said to be felt, but there is a general easterly direction during one part of the year and a general westerly at another. Its force is usually from 1 to 3 and is never more than 4.

From July to September the prevailing winds are between north-east by north and south by east; during October and November they

begin to work around toward the southwest by west, being, generally speaking, between southeast by east and west by south, though very variable, until in December, when the prevailing winds become decidedly northwesterly and southwesterly and much steadier in direction.

Gizo Island (lat. $8^{\circ} 06' S.$, long. $156^{\circ} 50' E.$), the westernmost of the main group that has been surveyed, is comparatively low. It measures $5\frac{1}{2}$ miles in length in a northwest and southeast direction by 3 miles in breadth, and is 654 feet above high water near its southern end. It is apparently of coral formation, densely wooded and undulating, but without any prominent feature. The island is being cleared for a Government plantation. The southeastern side and most of the reef islets are planted with coconut palms.

There are numerous islands and reefs extending on all sides except the southwest, which has a fringing reef extending 500 yards offshore in places.

From the southern extremity of the islets off the northern end of this island a narrow reef, with depths of 4 fathoms, extends about 2 miles to the southward. The western edge of this reef breaks in a heavy swell.

An isolated patch of 4 fathoms is situated about $\frac{1}{2}$ mile westward of the south end of this reef; its position is doubtful.

The southern side is densely wooded to the water's edge, and has three shallow indentations, with possible landing for boats in fine weather, in the central one.

The northern side has several inlets, one of which is $1\frac{1}{4}$ miles in length. The points dividing them are hilly and wooded and the coast is deeply fringed with mangroves.

The southeasternmost indentation is Gizo anchorage, which is completely sheltered. The island is occasionally visited by natives from the adjacent parts.

Supplies.—Most of the reef islets, as well as the main island, are largely frequented by pigeons, which are easily shot. Many turtle also were seen in the shallows on the reefs. There is no fresh water procurable.

Coast—Dangers.—Reefs, dry in patches, extend about 2 miles off the northern end of Gizo Island, on the outer edge of which are four islets, all wooded, and one sand cay. About 800 yards outside this reef and northwestward of the extreme of Gizo Island is a patch with $3\frac{1}{2}$ fathoms water over it.

On the eastern side of the island the reefs are broken, affording passages for boats. In many places there are wooded reef islets and coral rocks.

These reefs, plainly visible and with many islets marking them, continue for a distance of nearly 5 miles southeastward of Gizo

Island, Cross Island and several others situated near the extreme forming the northwestern side of Ferguson Passage. Between Cross Island and Gizo lies Long Island, and nearer to Cross Island is one 120 feet above high water. The line of Barrier Reef on the eastern side is broken by six channels, several being very intricate; but with a small handy craft and a good light they may be attempted. The depths in them vary between 6 and 30 fathoms.

Eeles Patches consist of two shoals near the outer edge of the 100-fathom curve southward of Gizo. The eastern and larger one has a least depth of 4 fathoms near its northern end, with the eastern extreme of Gizo Island bearing 29° , distant $3\frac{1}{2}$ miles; the western patch, with a depth of 8 fathoms over it, lies 297° , distant 1 mile from the preceding.

At 1.1 miles 114° from the 4-fathom patch a shoal on which the depth is 5 fathoms lies on the western end of the prolongation of the Barrier Reef under water, on which Cross Island is situated. This sunken portion has depths varying from 5 to 8 fathoms over it, and has been observed to break in places in heavy weather.

Gizo anchorage (lat. $8^{\circ} 06' S.$, long. $156^{\circ} 51' E.$).—This harbor is the chief commercial port of the Solomon Islands and the port of entry for the central islands of that group. It is the residence of the deputy commissioner. The islet at the northwest end of the anchorage is very conspicuous, having several houses and stores on it.

A Government station, gaol, police quarters, etc., have been erected on the shore of Gizo anchorage, which is situated on the northern side of the southeast extreme of Gizo Island, and here there is a native settlement, land in the vicinity having been cleared and planted.

Islands.—The local name of Shelter Island is Loga; that of Latitude Island, Nusatupi; and that of the island 160 feet high southward of Latitude Island, Apanga.

Anchorage.—The plan shows anchorage, in about 16 fathoms water, at about 200 yards northward of the settlement.

Directions.—Vessels approaching Gizo anchorage may pass to the westward of or between Eeles Patches, where the least depth is 23 fathoms; but the best track is probably to the eastward of them.

A small islet on the Barrier Reef just open of the eastern extreme of Gizo, bearing 19° , or the point on that bearing, leads 500 yards eastward of the 4-fathom patch, 800 yards westward of the sunken barrier, and about the same distance westward of a 4-fathom patch on the western extreme of another sunken ledge.

When the southwest extreme of Gizo Island bears 300° course should be altered to 33° for the sandy northern point of Latitude Island, which will lead 150 yards eastward of the Gizo fringing reef, which always breaks. This reef, which is steep-to, should be rounded

at about this distance to the anchorage, in order to avoid several shoals on the eastern side.

If wishing to proceed to the northward by the reef channels, pass between the reef off Shelter Island and the $1\frac{1}{2}$ -fathom patch, which lies 200 yards off its southeast end; thence round the northwest end of the reef off Latitude Island, which is steep-to, taking care to avoid the patches which lie 300 yards off it. The channel to the southward of Latitude Island is not recommended.

The broadest, and perhaps the best, of the barrier reef channels, with depths of from 4 to 6 fathoms, lies with the southern extreme of Latitude Island a little inside the southern extreme of Gizo Island, bearing 258° .

At about 1 mile 90° from the north end of Latitude Island is a small wooded islet on the northern extreme of the reef which lies on the northwest side of this channel.

Tides.—The observations with regard to tides in this locality can be only very general, as they are based only on the result of one lunation, observed during the months of October and November.

The greatest range observed was 3 feet, and the least 1 foot. There was only one tide in the day.

The time of high water was very irregular, and occurred during the above observations between the hours of 11 p. m. and 10.15 a. m.

The time of low water appeared to be far more constant and occurred between the hours of 3.30 p. m. and 6.15 a. m.

Gizo Strait separates Gizo Island from Vella Lavella Island. Between Billowa Point, the southeast extreme of the latter, and the reefs extending from Gizo it is apparently about 4 miles wide, but it has not been surveyed.

Ferguson Passage (lat. $8^{\circ} 09' S.$, long. $156^{\circ} 57' E.$), which lies between the barrier reef of Gizo Island and the reef which extends westward from Wana Wana Island, is $1\frac{1}{2}$ miles in width. The reef on both sides is steep-to and it is free from dangers.

The passage may be recognized by the difference of height of the islets on either hand, those on the Gizo side being about 120 feet above high water while those on the Wana Wana side are considerably less. The western extreme of Kulambangra, bearing 2° , leads through in mid-channel.

On the eastern side, within Wana Wana Reef, is Fairway Island, on the northeastern extreme of a reef $\frac{1}{2}$ mile in length. This reef, being steep-to, may be passed on either side.

The islets on the Gizo side of this passage are planted with coconut palms; those on the Wana Wana side are thickly wooded and the higher of the two groups.

Kulambangra (Duki) Island—General remarks.—Kulambangra is the northwesternmost islands of those surveyed. It forms

the northern side of Blackett Strait and western side of Kula Gulf, and is an extinct volcano of imposing proportions, rising directly from the sea in a fine sweep to a series of remarkable peaks, which form the top of the crater. This crater, on both the eastern and western sides, is broken down into two magnificent gullies, through which the steep inner walls may be viewed. The whole is densely wooded. The slope abreast the eastern and larger gully is more gradual, terminating in a nearly level district of dense mangrove swamp.

The general even slope is broken by a cone 1,743 feet above high water on the northeast side and by a mountainous ridge of rugged volcanic appearance on the southwest side, near the end of which is a square-topped crater of 1,818 feet, whence the shoulder falls to the coast in two rounded ridges.

The island is nearly circular, about 15 miles in diameter, free from offlying dangers, and steep-to outside the shore reef, which extends only a short distance and is always visible. It is indented with numerous creeks and lagoons, most of which are bridged across by small barrier reefs; a few, however, afford anchorage for small craft.

The coast is lined with mangroves and trees, the branches of which project over the water for 30 to 40 feet in places.

Natives.—There were no natives (at the time of the survey in 1894) living near the coast, all having been killed or driven inland by the head hunters, principally from Veka Vekalla, but there are said to be a number of bushmen on the slopes of the hills, about $1\frac{1}{2}$ miles southward of Ariel Cove, where there are some houses in a grove of coconuts; but the natives do not live there permanently, only using them when disposing of their copra to the white traders.

Water.—Fresh water can be obtained at most of the small streams around the island.

Sandfly Harbor and Ariel Cove, on the western coast, are anchorages for small craft only. Ariel Cove is 100 yards wide in the entrance, with a depth of 10 fathoms and from 8 to 10 fathoms within. From Sandfly Harbor the southern peak of the crater bears 95° and from Ariel Cove 67° .

Webster Cove (lat. $8^{\circ} 07' S.$, long. $157^{\circ} 06' E.$), on the southern coast, affords a safe anchorage for small vessels in depths of from 16 to 17 fathoms.

The entrance is clear of dangers. A mid-channel course should be steered and the anchor let go in about the center of the cove.

Elliot Cove, eastward of it, is not recommended.

Devil Islet, a small coral islet 500 yards off the southeast point of Kulambangra is steep-to off its eastern side, but there is no clear passage between it and the shore. The island was partly cleared in

1894 and planted with young coconut trees which were doing well in 1895.

It is a great resort of pigeons which come there to roost.

East coast.—**Bat Harbor**, $3\frac{1}{2}$ miles northward of Devil Islet, affords good anchorage in from 18 to 20 fathoms water, shoaling at its northern end. It has not been sounded out, but the British naval vessel *Penguin* anchored there upon several occasions. The entrance from outside, from which the square-top peak of Kulambangra bears 280° , is quite clear. To enter, a mid-channel course should be steered, the inner northern point rounded closely, and the anchor let go in about the center of the northern arm.

Jack Harbor.—Two miles northward of Bat Harbor is another good anchorage which was frequently used by the *Penguin*. The entrance is not easily seen till well open when the square-top peak of Kulambangra will bear 270° .

The entrance is narrow and the northern point, which is quite steep-to, must be kept close aboard till the reef on the southern side, which extends for about a third of the distance across, is passed. A middle course can then be steered, and the anchor let go in a depth of 14 fathoms between the two inner points with Mount Vina Roni on the main island showing in the fairway of the entrance.

Tides.—The tides are irregular; the approximate range is 3 feet.

Bennett Cove, $1\frac{1}{2}$ miles northward of Jack Harbor, affords good boat anchorage.

There are three other passages through the fringing reef where boats could obtain shelter, one on the northern and two on the western sides of the island.

Wana Wana Island, lying off the western end of the main island, is divided from it by the channel known as Hathorn Sound (the northern part) and Diamond Narrows.

The island appears to be of coral formation, is generally flat, and about 200 feet high, but with a few slight rises, one near the western extreme being 348 feet above high water. It is densely wooded to the water's edge from whence it rises gradually to the elevations above named.

The southwestern face has a broad bay and several small indentations, one of which is a lagoon. There are no coconut trees visible along the coast, and it is apparently uninhabited and waterless.

Barrier reef.—Nearly the whole of the western coast is fringed by a narrow reef as far as the island off the peninsula which forms the head of a shallow lagoon almost impracticable to boats; thence a barrier reef extends northwestward to a distance of 4 miles beyond Lebrana Point, the western extreme of Wana Wana, with islets and rocks on it in places. This reef forms the eastern side of Ferguson Passage, and at $\frac{1}{2}$ mile within its extreme point is Unwin Island.

The reef is steep-to throughout its whole length and there is no anchorage anywhere off it.

Landing was extremely difficult on this coast during the survey, owing to the continually breaking surf.

From Unwin Island (lat. $8^{\circ} 10' S.$, long. $156^{\circ} 58' E.$) the barrier reef extends eastward to the northern extreme of Wana Wana, following the southern side of Blackett Strait. There are many islets on the reef, which is steep-to.

The inlets in the lagoon are the haunts of numbers of alligators. One of these inlets, on the northern side, is reported to lead to Rubiana Lagoon.

Blackett Strait, between Kulambangra on the north and Gizo and Wana Wana Islands on the south, is a deep channel and apparently free from dangers. The southern or Wana Wana side is the best to keep aboard, the reef being steep-to, and the islands standing on the edge of it. The eastern part of the straight is only $\frac{1}{2}$ mile wide, opening out beyond Devil Islet into Kula Gulf.

Tidal streams.—The tidal streams run at the rate of 2 knots through the narrows, the flood to the eastward and ebb to the westward, with eddies and tide rips in places.

Anchorage.—Good anchorage, in depths of from 12 to 14 fathoms, may be obtained close to Kulambangra in Blackett Strait Narrows, close to a small gap in the mangroves, with the southern peak of the crater bearing about 334° and Devil Islet in line with the southern extreme of Kulambangra 86° .

Kula Gulf lies between the eastern coast of Kulambangra Island and the western coast of the north extreme of New Georgia main island.

It is about 15 miles in length in a northeast by north and opposite direction, and apparently about 13 miles in breadth at its northern entrance, reduced to about 7 miles near its head, at the entrance to Hathorn Sound and Diamond Narrows.

The gulf is very deep, being steep-to on its western and apparently so on the eastern side. A depth of 240 fathoms, mud, is charted near its center, about 3 miles from the western shore, and 111 fathoms near its entrance to Hathorn Sound.

Bat and Jack Harbors are situated on its western shore, which has been surveyed. These have been described.

Blackett Strait, above described, leads westward from Kula Gulf, between Kulambangra and Wana Wana Islands, thence southwestward by Ferguson Strait, or northwestward to Vella Gulf.

Hathorn Sound, at the head of Kula Gulf, is narrow, but it is the deepest channel leading into Rubiana Lagoon. It lies between Wana Wana Island and New Georgia main island.

Hathorn Sound, also Kolieuro Inlet and Rice Anchorage, situated on the eastern shore of Kula Gulf, are described with the north coast of New Georgia main island.

This coast has not been surveyed, with the exception of the anchorages just mentioned, and should be given a wide berth.

New Georgia, main island, is bounded to the westward by Hathorn Sound and Diamond Narrows, from which it extends about 50 miles in an easterly direction, where it terminates in Vina Vina Mountain, being separated from Vangunu by Njai Passage.

There is apparently no recognized native name for the whole island.

It is mountainous throughout. In its western portion is the knife-edged peak Kusage, 2,696 feet, with the remarkable peak of Vina Roni, shaped somewhat like a couchant lion, 2,251 feet above high water, 3 miles southward, and Vina Kiki, a sharp nipple, about the same height, near it.

In the eastern portion is Karu Mahimba Range, the highest part of which is a double peak 2,670 feet, eastward of which is Vina Vina, 1,962 feet above high water, the valley between being very marked from Blanche Channel. These mountains are chiefly toward the northern side of the island. Southward of them is a fairly level plain some 200 feet above high water.

Rubiana Lagoon—Barrier reef.—From the southern extreme of Wana Wana springs a barrier reef, partly awash and marked by numerous islands on it. This reef fronts the southern coast of the main island for a distance of about 30 miles, inclosing Rubiana Lagoon, while its outer edge forms the northern boundary of Blanche Channel.

Rubiana Island (lat. $8^{\circ} 21' S.$, long. $157^{\circ} 19' E.$) stands on the eastern corner of the reef, and is a prominent object. It is densely wooded, with two not very well marked hills, the western of which is 376 feet above high water.

Farther eastward are four more large islands of various shapes with narrow passages between them, forming the remainder of the barrier to the lagoon. Owing to their similarity in height, about 200 feet, and being densely wooded like the land at the back, these islands are not distinguishable from seaward as such. Three prominent points occur which are coral cliffs about 120 feet high. The seacoast of these islands has a narrow fringing reef which is steep-to, depths of 100 fathoms and more being found within 200 yards off it.

Rubiana Lagoon takes its name among the traders from Rubiana Island, which, prior to 1892, had on it a large village, destroyed by the British naval vessel *Royalist* in that year.

The lagoon is of varying width, the greatest being about 2 miles, and many islets and shoals are scattered throughout its extent.

The coast of the main island forming the northern side of the lagoon is indented considerably and where the coconut plantation ceases is usually fringed with mangroves. There are several creeks and streams. The southern point of the main island is covered with villages.

Entrances.—The only safe entrance for large vessels is through Hathorn Sound and Diamond Narrows, along the northwestern side of main island. Munda Bar and Onaiavisi are smaller entrances on the south side, described below.

Munda Bar—Directions (lat. $8^{\circ} 21' S.$, long. $157^{\circ} 13' E.$).—Trading schooners and other small craft enter Rubiana Lagoon over Munda Bar, in the barrier reef, which has between 2 and 3 fathoms water over it. Mount Vina Roni, in line with Nususonga Island (distinguished by a trader's house and coconut trees), bearing 55° , is said to lead over in the deepest water.

There is often a heavy swell on this bar, and it should not be attempted by a vessel above 9 feet draft.

A temporary buoy has been placed by the traders on the southern tongue of the shore reef, a little over 1 mile within the bar, which may be rounded closely if desirous of reaching Nususonga. A course should then be steered for a perch built on the western point of the reef on which Nususonga stands, between a detached reef and the main reef west of it.

If proceeding to Mbapaka Island, off Rubiana village, masthead navigation is necessary. Explicit directions can not be given.

Onaiavisi entrance.—There is a difficult passage, between the reefs, eastward from abreast Mbapaka Island to Onaiavisi entrance, 3 miles northward of Sturdey Point, the southeast extreme of Rubiana Island, which, however, is deep enough for small craft. The same may be said of the routes by all the entrances, namely, that they are possible to small craft but extremely difficult and tortuous.

Entering Onaiavisi from seaward there is anchorage for vessels not above 200 feet in length, in a depth of 27 fathoms, about 200 yards within the entrance. The British naval vessel *Rapid* (1897) anchored here.

There are four other entrances into the lagoon between the islands to the eastward. At the fourth from Rubiana Island is Saikila village, and from that to the eastward the lagoon is narrow for a distance of about 3 miles, thence opening up into a large bay, its termination.

Tides.—At Nususonga Island the time of high water, at full and change, is irregular; the extreme range observed was 4 feet. One tide occurs more frequently than two in the 24 hours.

Natives.—Rubiana Lagoon is by far the most populous portion of New Georgia, the natives numbering nearly 2,000. They were

(1893–1895) most inveterate head-hunters and have by this means assisted in killing off nearly all the inhabitants of the neighboring islands and shores.

Ingova, the principal chief or king of Rubiana, professes to be on good terms with the white men, and is said to have protected the lives on several occasions of the three or four traders who live on islets closely adjacent to his village. Many of the natives speak English; they are all keen bargainers, and any ship anchoring in Rendova Harbor will find that they have crossed the channel from the lagoon with fruit, vegetables, fish, and curiosities for sale. They almost always carry tomahawks in their canoes, which, however, should not be allowed to be brought on board, and, altogether, they should be treated with considerable circumspection.

At the annexation of New Georgia, in 1893, the British flag was hoisted at Rubiana.

Off-lying islands.—Tambatuni (lat. $8^{\circ} 21' S.$, long. $157^{\circ} 23' E.$), 280 feet above high water, lies about 2 miles eastward of Rubiana Island, with a small fringing reef on its northern side. It is otherwise clear of reef and steep-to.

At $7\frac{1}{2}$ miles eastward of Tambatuni is Ndoki Ndoki Island, about 200 feet above high water, 600 yards southward of the bold point of one of the barrier islands. The passage between is deep and clear. The island is bold and surrounded, except in one small place, by a barrier reef, some of which is above water and with vegetation.

Mbalu Mbalu, about 250 feet above high water, $2\frac{1}{2}$ miles in length and $\frac{1}{2}$ mile in breadth, with Langarana, a small islet off its northern extreme, lies southward of Ndoki Ndoki, with Gubbins Channel between it and the peninsula forming the easternmost entrance to Rubiana Lagoon.

Coast.—From this peninsula the coast trends in a southeasterly direction for 10 miles to Penguin Point, and the whole of it is featureless.

There is no anchorage anywhere, the narrow fringing reef being steep-to.

Perpendicular coral reefs, as even topped as a wall and about 130 feet above high water, begin at 3 miles westward of Penguin Point, whence the coast trends eastward, still bold, but more broken up. At $2\frac{1}{2}$ miles eastward of the point there is a break in the cliffs, affording entrance to Viru Harbor.

A coral bank of 20 fathoms is charted $1\frac{1}{2}$ miles southwestward of Penguin Point. There may be shallow water in this locality.

Viru Harbor is about a mile in length, with depths of from 9 to 12 fathoms, over mud. The entrance, flanked by perpendicular cliffs on either side, is $\frac{1}{2}$ mile in length by 300 yards in width, but the navigable channel, which is deep, is reduced to something less than

200 yards by the fringing reef on either side. The western reef always breaks, and the eastern is visible from the masthead, if not breaking also.

On entering, after rounding the eastern bold point, care must be taken to avoid a reef which is difficult to make out on account of the discolored condition of the water, extending 100 yards from the low inner point on the western side. After rounding this reef anchor as requisite.

It is best to anchor at short stay, as the swinging room for a vessel above 120 feet in length is not large, owing to the sudden shallowing of the mud bank and the reef off the mouths of the western streams.

This harbor is landlocked, so that the swell never comes in, and it affords the only shelter or anchorage of any sort along the whole of this coast.

The British naval vessel *Penguin* anchored here several times, and though the trade wind seldom reaches the inside of the harbor, no fever or other ill effects were felt from the stillness of the air nor from the miasma usually engendered in tropical rivers.

Streams.—The land is flat on either side, about 130 feet above high water, and continues flat to the foot of the Karu Mahimba Range, of which a very prominent hornlike summit is visible from the harbor. The stream nearest the sea on the western side is the Mango; the one near it is the Tita, while the third, in the eastern corner, is the Viru. They are all about 80 yards wide at the mouth and navigable by boats.

Chomborua village is about $1\frac{1}{2}$ miles up the Tita, and Viru, a larger one, up the Viru, at about the same distance. Coconut palms arch over the stream from both banks, and there is a good deal of cultivation around the village.

Natives—Supplies.—The natives were friendly. Pawpaws, sweet potatoes, taro, and coconuts are obtainable in exchange for the usual trade articles.

Water can only be found by going almost to Viru village, 2 miles up the stream, the country being so flat and the river so sluggish that the tidal stream finds its way for fully that distance.

Tides.—The tides are weak and irregular.

Coast.—**Monro Bay**, the bold-shored bay southeastward of Viru Harbor, is too deep for anchorage.

Cliff Point.—The even-topped coast cliff terminates 6 miles southeastward of Viru Harbor in a prominent spur, also perpendicular, and 130 feet above high water, named Cliff Point. Both sides of this point are bordered by small barrier reefs inclosing narrow lagoons deep enough for a boat. On the northern side is a native landing place and a track through the bush.

Reynolds Bay is formed by a narrow ridge of coral, with trees growing on it the tops of which are about 100 feet in height. It terminates in Hecla Point, 3 miles southward of Cliff Point, where the Hele chain of islands begins.

Penguin Reef (lat. $8^{\circ} 38' S.$, long. $157^{\circ} 49' E.$), a small flat reef with dry rocks and a few bushes, steep to all round, lies with Hecla Point bearing 36° , distant 1,400 yards. The sea is generally breaking on it.

Hele Islands.—The reef on which this chain stands, together with the promontory from which it tails off, affords an interesting example of the various stages of a barrier reef in every condition of upheaval. This promontory begins about 1 mile northward of Cliff Point, where on the cliff faces may be seen scooped in the coral the position of an ancient sea level, which has been eroded to a considerable depth and is at present about 20 feet above high water.

From the abrupt western cliff the coral slopes gently down to the water on its eastern face and also tapers gradually to the spot where the detached islands on the reef, now level with the sea surface, begin to form.

The reef takes a southerly direction from Hecla Point for about 7 miles and thence a westerly direction for about the same distance to Morton Island. At the elbow and also northward of the island at the elbow the reef is sunken with depths of 3 to 4 fathoms.

South Islet, with trees about 90 feet high, lies $1\frac{1}{2}$ miles southward of Morton Island, with sunken reef extending halfway toward the latter. South Islet, with East Islet 3 miles eastward of it, on which are trees of about the same height, are connected by sunken reef, which also extends a mile southeastward of East Islet.

They are little visited by the natives, except when fishing, but they are frequented by large numbers of pigeons.

About 3 miles eastward of East Islet is a large sunken atoll, with a deep-water channel between. It measures about 3 miles in length by 1 mile in breadth, with from 3 to 6 fathoms water on its rim, encircling depths of 30 to 50 fathoms.

About a mile eastward of it is a reef, 2 miles in length, with depths of from 4 to 7 fathoms over it.

Another reef, with probably 5 fathoms least water over it, lies southward of the sunken atoll and $4\frac{1}{2}$ miles 145° from East Islet. There is a reef with 3 fathoms and probably less water over it southeastward of the elbow of the Hele chain of islands.

The whole of the western side of the Hele chain is steep-to, the 100-fathom line lying probably within $\frac{1}{2}$ mile of the reef.

Panga Bay.—The lagoon or bay formed between Hele chain and Vangunu Island, and known as Panga Bay, is encumbered with reefs. About its center wooded islets of a uniform height are

sprinkled about, becoming more numerous as the head of the bay under Mount Vina Vina is reached. In this sheltered spot are several villages and a fairly numerous population. It is visited by the traders, to whom it is known as Nono, the name of one of the many districts into which the inhabitants divide it.

Unless a native be procured to navigate through the labyrinth of reefs, any boat of 3 feet draft would have considerable difficulty in reaching the villages.

Njai Passage (lat. $8^{\circ} 34'$ S., long. $157^{\circ} 54'$ E.).—At the northeast corner of the bay is Njai Passage, between the main island and Vangunu, leading to Marovo Lagoon. It is 670 yards wide in its narrowest part, apparently clear of dangers, and with a depth of about 20 fathoms.

In March, 1894, a white trader from Marovo Lagoon was murdered in the Panga Bay entrance to the passage. The murderers were natives of a district known to the traders as Soy, which is situated up a river at the head of Panga Bay, near the Nono district.

Blanche Channel is inclosed between main island of New Georgia and the Hele chain on its northern and eastern sides, and by the islands Rendova and Montgomery (Tetipari) on its southern and western sides.

Its average breadth is about 13 miles, but the entrances are considerably narrower, being 6 miles at its eastern end and 2 miles at its western; while Balfour Channel, between Rendova Island and Montgomery Island, is only $1\frac{1}{2}$ miles wide.

Blanche Channel and its entrances are deep throughout, and the shores are steep-to on all sides.

Rendova Island, which lies off the southwest end of the main island, is about 21 miles in length in a north and south direction, with a varying breadth of $1\frac{1}{2}$ to 8 miles. The whole is mountainous and densely wooded, gradually increasing in height from its southeast extreme, where it is 1,021 feet in height, to its summit, a steep volcanic cone named Rendova Peak (Uweli), 3,488 feet above high water, situated 4 miles from its northern end, and forming a conspicuous object. The summit is an extinct crater $1\frac{1}{2}$ miles in length, broken down on its western side, and is frequently covered with clouds.

Banyetta Point, the western extreme of Rendova Island, is faced with a black sand beach which is steep-to and around which the tidal streams set strongly. From Banyetta Point to about 7 miles northeastward the coast is thickly wooded, with occasional black sand beaches, and is steep-to.

From thence to the north point of the island the coast is fronted by a barrier reef at a maximum distance of $2\frac{1}{2}$ miles, through which there are about six deep-water passages, and with islands on the

northern reefs. The lagoon within is shallow, with several reefs, and the coast is much indented. Several streams discharge into it.

Rendova Harbor (lat. $8^{\circ} 24' S.$, long. $157^{\circ} 19' E.$) lies westward of the north point of Rendova Island, between that island and the reef islands and barrier reef westward of it. The native name of this district is Uveli.

The entrances are two deep channels in the barrier reef, one to the eastward of Kuru Kuru, the westernmost island, the other $1\frac{1}{2}$ miles farther eastward, between Bau and Kokorana Islands, the latter being Renard Entrance.

All the dangers within the harbor are inclosed by the 10-fathom curve, which hugs the northern boundary of the reef and islands closely, but lies at some distance off the southern shore, extending in the form of a tongue toward the center of the harbor. It has at its end Mboku Islet and two reefs, nearly dry at low water.

All of the islets inclosed in this boundary are planted with coconut palms and bordered with mangroves on the fringing reef.

There are no natives living on the shores of the harbor. The coconut plantations, which are on all the islands, islets, and mainland bordering it, belong to the Rubiana natives, who cross almost daily from their villages to make copra, etc. Several houses and a small pier are situated on the point eastward of Buraus Island.

- **Dangers.**—The principal danger in the harbor is within Renard Entrance on the western side and consists of two shoal patches 100 yards apart. The outer one, with $1\frac{1}{2}$ fathoms water over it, lies with the southeastern extreme of Bau Island bearing 57° distant 350 yards.

Abreast this danger but on the eastern side is the reef and the shallow water off Pango Pango Island, one bowlder of which is visible even at high water. The western extreme of this reef lies with the southeast extreme of Bau Island bearing 14° , distant nearly 350 yards.

Beacon.—A small tripod beacon is situated on the outer rock westward of Pango Pango.

Renard Entrance.—The northern channel to Rendova Harbor lies between Bau and Kokorana Islands. It is at its narrowest part 200 yards wide between the shore reefs, which extend 70 yards from both the entrance points. They are steep-to on either side, and the least depth in the channel is 8 fathoms.

Those wishing to enter Rendova Harbor by Renard Entrance may recognize it by the fact that there are coconut palms and a sandy beach on both sides of it. It is otherwise difficult to distinguish, especially to those coming from the eastward, from its similarity in width and general appearance to the passages between the other islands which border this part of the coast.

To enter, keep the vessel in mid-channel, and when abreast the southeast corner of Bau Island the helm should be quickly put over and a course steered for the center of Mboku Island, thus passing between the reef off Pango Pango and the $1\frac{1}{2}$ -fathom patch off Bau, anchoring as requisite northeastward of Mboku, in a depth of about 15 fathoms.

Tidal stream.—The tidal stream sets strongly across the mouth of this channel, and great care is necessary to prevent a vessel from being set on to one or other of the points of the shore reef. It also sets strongly through the passage, and has been observed to run in opposite directions at the same time along the two shores.

Western entrance.—Under favorable conditions of light the western entrance is recommended. Its general width is about 300 yards. The tidal streams are much less felt than in the Renard Entrance, and also, when once the entrance between the reefs has been made, there are no dangers to be avoided, except an offlying reef, which dries in patches, the northern extreme of which lies with the southwest extreme of Lumbari Island bearing 58° , distant 450 yards.

After entering, a vessel should pass midway between Koru Koru Island and Lumbari Island, the reef being steep-to on either hand; then rounding the southern end of Lumbari Island at a not less distance than 200 yards may proceed to an anchorage as requisite. There is no passage for vessels northward of Lumbari Island.

Boat passages.—There is a passage for boats over the reef northward of Lumbari Island; and it is also possible at high water to pass through the break in the islands to the westward of Bau Island over the reef, where there is a small coconut-planted islet in mid-channel.

Observation spot (lat. $8^\circ 23' 57''$ S., long. $157^\circ 19' 9''$ E.).—The observation spot of the British naval vessel *Penguin*, depending on Telegraph Station, Thursday Island being in longitude $142^\circ 13' 25''$ E., was on the northeastern side of the small island 400 yards northward of Lumbari Island.

Supplies.—If a vessel should be lying in the harbor the Rubiana natives usually bring over fish, vegetables, etc., for trading purposes.

Water may be obtained from Seroko River, abreast Tambusolo Island.

Coast—Tippinge Creek.—From Renard Entrance eastward there is a succession of islets, similar in appearance to those mentioned, bordering the coast, with passages between them. These continue for a distance of about 3 miles, when the general direction alters to the southeastward, with a long indentation, at the end of which is Tippinge Creek, a safe anchorage for small craft, in about 10 fathoms water, protected by an island and reef.

The native name for this district is Korari, and there is a small village near the head of the creek.

There is a stream running down from the mountain, off the mouth of which lies a bank of small bowlders extending nearly 200 yards from the shore. Care should be taken to avoid it when making the anchorage, as it is hard to distinguish.

Anchorage.—In the next mile southward of Tippinge Creek are two small bays, the first of which has a reef, dry at low water, extending nearly across its mouth, and would afford shelter to boats or small craft, with anchorage in depths of from 9 to 11 fathoms.

At the southern end of the next bight is Turenga village and river, the latter available to boats.

Close southward of Turenga is a cove affording shelter to craft of light draft. Care should be taken to avoid the fringing reef on either hand in entering, which, however, has deep water between. The general depth inside is from 7 to 8 fathoms.

There is a bar of sunken reef across the cove near its head.

Supplies.—At the time of the survey the natives appeared to be friendly, and a few supplies of vegetables, etc., were obtainable.

Renard and Blanche Islands are situated off a headland on the east side of Rendova and are, respectively, 200 and 216 feet above high water. There is an islet 180 feet high westward of Renard. They are uninhabited and the passages between them are deep.

Benard Cove is a snug anchorage within the headland. Anchorage may be obtained in 17 fathoms water around the second point on the headland side, taking care to pass the sunken fringing reef off it at a safe distance. This reef is clearly visible from the masthead.

Coast.—Continuing southward along the coast, a black sandy beach, on which the surf is generally breaking, forms a slight bay 2 miles wide, the southern extreme of which is a rather prominent low, rounded point, with coconut palms and clumps of trees, from which the coast trends southward for a distance of $5\frac{1}{2}$ miles, wooded to the water's edge.

To the southward there are sand beaches here and there on which the sea breaks.

Pleasant Point (lat. $8^{\circ} 44'$ S., long. $157^{\circ} 25'$ E.), the southeast extreme of Rendova, forms the western side of Balfour Channel. This part of the island is a narrow ridge with a series of hills, averaging 1,000 feet above high water and rising rapidly from the coast.

West coast.—The west coast is high, the hills descending abruptly. Bluff Point lies between Pleasant Point and Banyetta Point, the western extreme of the island. The bay northward of Bluff Point is fringed with reef, and heavy rollers come in at times here. There are one or two villages and the shore is planted along almost its whole length with coconut palms.

It is everywhere wooded down the steep hillsides to the water's edge. The shore line is mostly of a coral nature.

Tidal streams.—The tidal streams run with some velocity along and parallel to this shore.

Balfour Channel lies between Pleasant Point and the reef off the western extreme of Montgomery Island. It is deep and safe and is nowhere less than $1\frac{1}{2}$ miles wide.

Tidal stream.—The tidal stream runs through Balfour Channel with moderate velocity.

Montgomery Island (Tetipari) lies eastward of the southeastern extreme of Rendova Island. It is 14 miles in length and its average breadth is $3\frac{1}{2}$ miles. This area is occupied by a rough, hilly country, but there are no prominent peaks. The heights vary between a long, hog-backed hill in the western part, 1,330 feet high, and the hilly country of the west, at an elevation of 1,140 feet, and those to the southeastward, with heights between 1,164 and 994 feet above high water.

The whole island is densely wooded to the water's edge and, as it was uninhabited (1893–1895) and has no proper anchorage anywhere, merits only a slight description.

Wild pigs exist in the bush, the descendants of those belonging to the former inhabitants, who were exterminated by the head hunters.

The southern shore, almost precipitous, is fringed with reef to the distance of $\frac{1}{2}$ mile in places and is steep-to. On the reef just westward of the center is a rock, with trees on it, 60 feet above high water.

Fury Shoal, with 4 fathoms least water over it and 1 mile in length, lies with Cape Nepean, the eastern extreme of the island, bearing 64° , distant 2 miles. It is steep-to all around and is generally visible from the masthead.

Cape Rice (lat. $8^\circ 46' S.$, long. $157^\circ 40' E.$), the northeast extreme of the island, is bold but not high.

The northern shore is bold from Cape Rice to Somerville Point, its northern extreme, and is steep-to. A rock 2 feet above high water lies $\frac{1}{2}$ mile offshore at 3 miles southeastward of the point. It is a rough, forbidding coast, difficult to land on, and composed of coral blocks, broken, fissured, and tossed about in the wildest confusion, with a thickly tangled undergrowth laid over it and heavy forest trees. From Somerville point to the western end of the island are several small bays, and, with the exception of one point, is free from cliff. The water is deep near to the coast.

Vangunu Island, separated from the main island by Njai Passage, is inclosed on all sides at varying distances from its shores by barrier reefs and islands which form around it a lagoon, into which entry from the sea can be made at various openings.

The main body of Vangunu is an extinct volcano, which culminates in the southern part of the island in a flat-topped crater broken down on its southeast side.

This crater forms a series of hills along the otherwise smooth edge of its basin at heights varying between 2,553 and 3,686 feet above high water, which are usually hidden in cloud. The crater measures 3 miles in length by $1\frac{1}{2}$ miles in width and its inner side is precipitous.

The southeastern portion of Vangunu is roughly circular, but on the northern side the regularity is broken by Mbariki Peninsula, which, though not attaining to so great a height, is more remarkable than the mountain of Vangunu itself from the peculiarities of its hills.

Most marked among these are Vongi, a strange, thumblike peak with precipitous sides 1,655 feet above high water, prominent from every direction in which it is visible; and the deeply cut notched hill Mangota, near Vongi, standing on the same shoulder and slightly higher, being 1,697 feet above high water.

The hills slope to the water line without cliff all the way around and are densely wooded to the beach.

The western, or Panga Bay, coast of Vangunu, being unapproachable by any vessels except small coasting and trading schooners, etc., does not deserve close description. It is indented by many coves and where shore reef occurs it usually takes the barrier form, inclosing shallow lagoons navigable only by canoes.

Both the inner and outer barrier islands present an even-topped appearance, and are about 180 feet in height, but those within the lagoon are about 90 feet and where cliffs occur they are about 140 feet above high water. All the islands are wooded.

There are several small streams in the island, with mud flats in their mouths. Some are accessible by boats.

There is no anchorage anywhere outside the reefs sheltered from the prevailing southerly and easterly winds, the reefs fronting the islands usually dropping suddenly into a depth of 20 fathoms or more.

Wickham Island—Anchorage (lat. $8^{\circ} 45' S.$, long. $158^{\circ} 04' E.$).—Between the long barrier island extending westward from Gatukai Island and Wickham Island, which lies off its extremity, is Wickham entrance, a deep-water passage clear of reef, leading into Kolo Lagoon and thence to Marovo Lagoon, both of which, however, can only be navigated by very light draft vessels from this direction, with the sun in a favorable position, or with local knowledge.

Barrier reef.—The sunken barrier reef extending southwestward of Wickham Island to about $2\frac{1}{2}$ miles offshore is shown on the chart. It has not been closely examined.

Directions.—To enter by Wickham Passage a vessel should approach Wickham Island from the southward, and rounding it at about $\frac{1}{2}$ mile distant, on its eastern side, steer a course 283° , passing 200 yards northward of the island, which has no reef on its northern side.

On the north side on entering, the barrier island tails off to a sand spit, which has a small islet on its extremity, with one or more palms on it. A fringing reef extends 200 yards from the islet and is steep-to. This reef should be rounded at 200 yards distant, and courses may then be steered for the anchorage, which is in about 24 fathoms water, over coral and sand, midway between Emma Point and the barrier island.

There is a passage for boats eastward of the island inclosing Wickham Anchorage, close to Gatukai Island; but if intending to go on into the lagoon, it is advisable to do so at high tide, as the water off the northwest coast of Gatukai is very shoal and the bay formed there choked with an almost continuous reef.

Natives.—The Panga Bay or western district of Vangunu is named Kalakao by the Nono natives, and is apparently uninhabited—certainly so as regards the coast.

The natives of Vangunu proper live back in the bush. Several huts may be seen on the crater or on the slope of the cone which faces it, where they have probably been driven by head hunters. The Gatukai natives look upon Vangunu as their peculiar hunting ground when heads are required, and (1893–1895) they spoke contemptuously of the Vangunu men as “man-bush,” so at that time they were probably quite savage.

A few natives were observed on the western coast, and there is a landing place on the southwest side (see chart), where a canoe was seen and the litter occasioned by copra making, so that it is probable that some of them are sufficiently advanced to trade with the copra schooners. The track from this landing place apparently leads to the villages in the crater, and the landing place is the only one clear of reef and surf for some miles on either side along the coast.

Mbariki Peninsula, on the northeast side of Vangunu Island, faces Marovo Lagoon, and is heavily timbered everywhere. Its coast line is broken by a succession of small bays, usually fringed with mangroves, but deep water is found close to the shore.

Mount Loanju (lat. $8^{\circ} 33' S.$, long. $158^{\circ} 07' E.$), a double peak 1,307 feet above high water, occupies the eastern part of the peninsula, and between it and the Mangota Hill district is a valley, not very marked except when exactly facing it.

The northwest district of the peninsula is called by the natives Repi, and is marked by Parepi Hill, 653 feet above high water, a somewhat prominent shoulder.

At the mouth of Okotsu River and along the adjacent shores stands Repi village.

Water.—The Okotsu stream furnishes good water, if obtained sufficiently high up, and was used, as well as others on the north side, by a surveying party from the British naval vessel *Penguin*.

Natives of Mbariki.—In 1893 the whole of the natives of Marovo Lagoon were on good terms with one another and with the white people. With the exception of the Vangunu bushmen, all these villages speak the same language, while to the westward of Viru the Rubiana dialect is used. Nearly everywhere will be found some man who can speak the broken English current in the South Pacific.

No estimate can be made of the number of the population, as a great many appear to have sought safety in the bush. The people living on the shore of the lagoon in the Repi district probably do not number more than 100.

Supplies.—It is almost impossible to procure pigs, and there are no fowls or eggs at all; but taro, papaws, sweet potatoes, coconuts, and bananas may usually be procured in exchange.

Coins are not yet understood, and the currency may be roughly said to be whales' teeth, calico, old clothes, tobacco, and biscuit.

Ringdove Bay lies between Mbariki Peninsula and Marovo Island. On its eastern side the hills rise rapidly and there are one or two tracks leading to villages in the bush, while its head is fringed with mangroves. The western half of the bay is fringed with dense mangroves. Toward its center is a chain of islets.

Mount Sumbulu, with a long flat summit 1,126 feet above high water, lies within the southwest corner, and the remainder of the western shore of the bay is formed by Marovo Island, which name has been adopted by traders, etc., for the whole lagoon and district. Warata and Maharo Islands, eastward of Marovo, are both uninhabited, but have small coconut plantations.

Marovo Island, about 2 miles long and $1\frac{1}{2}$ wide, has a high ridge extending its whole length, densely wooded, which terminates near the northeast extreme in a sharp and very marked double summit, 670 feet above high water, almost perpendicular on its eastern side, which is one of the most prominent objects in this part of the lagoon.

The northern coast of Marovo Island is deeply indented and is planted with coconut trees almost throughout its length. There are four small villages mostly situated near the points. The water is shallow in the approach, but there are no reefs off it which dry. It has not been surveyed.

Lagoon Islets.—There are several small lagoon islets off Marovo, one of which, Pulanga, has few houses on it; Tasukaka has a small coconut grove and Ngeringeri is covered with grass.

Mbeu Passage (lat. $8^{\circ} 31' S.$, long. $158^{\circ} 00' E.$) is the narrow shallow channel between Marovo and Vangunu Island.

Natives.—The many coral piers, turtle ponds, and coconut groves around the coast where there are now no longer villages are evidence to the fact that some years ago the island was well populated. A head-hunting raid by Rubiana men not many years before the survey, however, almost annihilated the inhabitants who scarcely numbered more than 50 or 60 in 1894. They are friendly to white men.

Supplies.—Small quantities of vegetables may be obtained, but no water.

Mungeri Village—Nduri Islets.—Westward of Mbeu Passage the Vangunu coast takes a general southward trend for 2 miles, forming a moderately deep bay, the whole of which is widely fringed by a reef rendering access difficult. Southwest of the bay is Levuka Village; and in the bight of the bay to the westward on a narrow point is Mungeri Village among the coconut trees. The bay terminates in a series of long, low islets, named Nduri, all planted with coconut trees, where there are also several houses. The westernmost extreme of these islets is named Rubiana Point.

The Mungeri natives are well disposed and accustomed to white men. Some of them understood a little English.

Supplies.—Vegetables in small quantities, such as sweet potatoes and papaws, may usually be obtained in exchange for the ordinary trade articles.

There is no water obtainable along the coast. The *Penguin's* surveying party were obliged to go as far as the Dorahana River, in the Karu Mahimba Range, to obtain any.

Coast.—From Rubiana Point the land turns sharply southeastward, forming a bay 3 miles deep with mangroves along its entire shore. The Patsaramane River falls into its head and close southward of it Njalire River.

A similar bay then occurs, stretching 2 miles southward, into the head of which falls the Pucha River. Thence the coast trends westward for $2\frac{1}{2}$ miles to Patu Tiwa Point, forming the east side of Njai Passage, which separates Vangunu from the main island.

The whole of the coast is bordered by mangroves, at the back of which is the dense bush covering the steep sides of the mountains.

There are no coast inhabitants in this vicinity.

Gatukai Island (lat. $8^{\circ} 47' S.$, long. $158^{\circ} 11' E.$) lies $4\frac{1}{2}$ miles eastward of the southeastern end of Vangunu, with a long, low island on the barrier reef between, on either side of which are entrances to Kolo Lagoon, the southern part of Marovo Lagoon.

The island is a volcanic cone, slightly flattened at the top, which is 2,912 feet above high water and, like Vangunu, is usually covered

with cloud. From it extends to the northward the barrier islands that embrace the lagoon surrounding Vangunu. The island is about 7 miles in diameter and is bold and steep-to on all sides except on the northern, which bounds the lagoon in that direction.

Cape Pitt, the southern point of the peninsula, forming the southeastern part of Gatukai, is a bold, dark cliff, about 150 feet above high water. On the northern side of the peninsula, built along the beach near the point, is Peava village.

The reef abreast it forms a lagoon 200 yards wide opposite the village, but a whaleboat can always cross the reef at a spot which the natives will indicate.

Natives—Supplies.—The natives here are friendly and in constant touch with the traders. There is another village on the southwestern side of Gatukai. Fresh vegetables in small quantities, and occasionally pigs, may be obtained at Peava.

At the head of the bay, northwestward of Peava, is a stream named Kawo Lavata (Big Freshwater), with a village of that name, where boats can obtain good drinking water with little difficulty. This bay is quite clear of dangers, but there is no anchorage for a vessel, though small trading craft may find it close to the beach.

Islets—Villages.—Ndoveli Islet stands on a reef projecting 600 yards from the shore at 2 miles northward of the stream. In its vicinity are two small villages, Chakopi to the southward and Som-biro or Loka to the northward.

The northern extreme of Gatukai is the west point of the entrance to Bili Lagoon.

On the northern shoulder of Gatukai are several patches covered with long grass, contrasting strongly with the surrounding forest, which, from their rectangular shape, look like gardens or plantations. They have not, however, been artificially cleared of trees, but are naturally bare, and they possibly indicate the presence of some mineral in these parts of the otherwise rich volcanic soil.

Male Male Island is small and low, with coconut palms growing in places on it to a height altogether of about 137 feet. It is situated about $\frac{1}{2}$ mile from the eastern extreme of Cape Pitt Peninsula, with deep water between.

There is a steep-to reef, which breaks if there is a swell, extending 400 yards northwestward of the island.

Mbulo Island, about 2 miles eastward of Gatukai, is about 2 miles in length by $1\frac{1}{2}$ miles in breadth and of coral formation, with steep coral cliffs from 100 to 150 feet above high water on its northern, eastern, and southern sides. The land rises from the westward in small but marked terraces to two conical peaks of nearly even height, being 842 feet and 767 feet, respectively, above high water. It is densely wooded throughout.

Mbulo is steep to all around except at one spot on its eastern side, where a small prong, with 8 and 10 fathoms on it, extends for 600 yards in an easterly direction.

All along the southwestern face there is a small barrier reef enclosing two shallow lagoons divided by a point of the coast line, each of them being from 200 to 400 yards in length. The shore inside this lagoon is a white sandy beach.

The northern lagoon is entered by a narrow break in the reef, only practicable for small boats at high water at its northern extreme, and leads to some huts on the beach, opposite which is the only safe landing on the island, except in very fine weather.

Kicha Island (lat. $8^{\circ} 47' S.$, long. $158^{\circ} 20' E.$), a small wooded island, with the tops of its trees about 100 feet above high water, lies $1\frac{1}{2}$ miles southeastward from Mbulo, the channel between being deep and free from danger.

There are no houses or coconut trees on it, nor is there any fringing reef. Landing can usually be effected in the cove near the north-eastern corner.

Caution.—Mbulo, Male Male, and Kicha are all used as burial places by the natives of Gatukai. Kicha is, besides, sacred, and no woman is allowed to land upon it. It is the native custom to erect altars, both on graves and in honor of the spirit supposed to be inhabiting such a place, on which such articles as shell rings, teeth, shields, and even human skulls are placed as votive offerings. The natives naturally resent any interference with these.

Brougham Shoal, with a least known depth of 6 fathoms over it in several places, with possibly less water, is about $1\frac{1}{2}$ miles in diameter, and its center lies with Cape Pitt, the southeast extreme of Gatukai Island, bearing 345° , distant $13\frac{3}{4}$ miles. It is visible from the masthead under favorable circumstances, and may possibly break in heavy weather.

Barrier reef and islands—General remarks.—From the northern extreme of Gatukai there extends northward a series of long but very narrow coral islands, evidently an upheaved ancient barrier reef, which maintains a uniform height of 130 to 150 feet, and are all densely wooded. The general trend is at first north by west for about 15 miles, when it gradually turns round to the westward and extends for many miles in that direction, skirting the coast at an average distance of 3 miles.

The lagoon thus formed is studded with a large number of islets of almost precisely similar appearance, wooded, rather flat topped, and about 80 feet above high water. It is known generally as Marovo Lagoon and its southeastern portion as Kolo Lagoon. The barrier of the eastern side of the lagoon may be said to be double from Gatukai to Kokwana Entrance. The inner wall of dry land is

formed by the northern promontory of Gatukai with the islands of Sanihulimu and Njapi Njanjamo. To the northward of Njapi Njanjamo the barrier becomes submerged and extends along Marovo Lagoon for nearly 3 miles, when it becomes broken up into reefs.

The outer barrier consist of the islands of Mboli, Karu Njiu Njapuana, Pori Pori, Matui, Tambaka, Pirikale, Lumalihe, Karikana, and so on, to the westward. The barrier can not be said to be continuous at first, but from Karu Njiu onward it is only broken in three narrow places, namely, the Tongoro, Kokwana, and Lumalihe Entrances to Marovo Lagoon. With the exception of Mboli, none of the barrier islands are inhabited.

The channel between these two barrier walls is deep, ranging between 40 and 120 fathoms, and to a vessel proceeding through it the effect is given of a canal between flat-topped wooded banks, 120 feet high, on either side.

Mboli Island, lying northeastward of the northern promontory of Gatukai, has a fringing reef, which is steep-to on its western side. There are no indentations of any note along its coast. Bili Island is joined to the western side of the northern and off Mboli Island by a neck of sand planted with coconut palms and on which is situated Bili Village. The bay formed by this junction is barred with reef, passable only to small boats, but outside it temporary anchorage may be found in a depth of 39 fathoms.

The outer coast of Mboli is steep-to and bold, and exhibits at its northern end, for a distance of $1\frac{1}{2}$ miles, a remarkable gallery cut in the face of the limestone cliff about 10 feet above the present high-water line. In some places this overhang is 15 feet deep, and this has been taken advantage of by the natives to construct a village named Bili Lupa (it being a continuation of the proper village of Bili). Stalactites and stalagmites in every stage may be seen along its extent.

The channel within Bili Island is only 500 yards wide, but safe and deep, and leads past the Bili Entrance in the inner barrier to Kolo Lagoon.

Bili Entrance to Kolo Lagoon is barred by a reef over which the tidal streams run strongly. There is a depth of about 3 fathoms on it near the Gatukai side, but it is only available for small vessels at slack water.

Totelavi (lat. $8^{\circ} 39' S.$, long. $158^{\circ} 13' E.$) is a perpendicular-sided coral rock 132 feet above high water, crested with trees, and having a few coconut palms growing round the base, which stands near the extreme of the fringing reef that projects from Chapa Point, as this part of the island of Sanihulimu is termed. Totelavi Rock is known to the traders as "The Flower Pot," and it resembles one to a considerable degree. It forms a prominent mark to indicate the position

of the Bili Entrance, which is frequently used by trading vessels entering Kolo Lagoon. There is a village on Totelavi, the houses of which are for the most part formed, as on the opposite shore at Bili, in a recess cut in the cliff by the sea before the islet was hove up to its present elevation. The landing place is on the southern side.

Natives.—The natives are friendly, and some understand English. The natives of Bili are friendly also. They made themselves most useful to the survey in procuring fish and vegetables. There is no water procurable anywhere in the vicinity.

Passage between the barrier islands.—There is a wide fringing reef along the whole sea face of Sanihulimu, in some parts of the barrier nature; and in two places there are clumps of trees standing on rocks on its outer edge. Except at one spot $1\frac{1}{2}$ miles from its northern end, it is steep-to, and here a few small outlying patches project about 200 yards from the reef. A mid-channel course through the passage will, however, clear all dangers.

Karu Njiu Islands (lat. $8^{\circ} 37' S.$, long. $158^{\circ} 13' E.$).—Proceeding to the northward from abreast Mbole Island, on the eastern side the Karu Njiu Islands will first be seen (Karu signifies "two"). They are joined by a reef which covers and uncovers and is generally visible. Both are steep-to. These islands have perpendicular cliffs on their sea face, but slope downward on the westward side. The southern one has a small barrier reef on its southeastern side inclosing a lagoon faced by a sandy beach.

The islands are thickly wooded and have a few scattered coconut palms growing on them. They are uninhabited and only visited by the natives when fishing.

Njapuana Island is the next island to the northward. Its southern point is 1,350 yards from the Karu Njiu Islands, with a deep, unobstructed channel between. Njapuana has perpendicular cliffs on its short eastern face 120 feet above high water, and the rest of its outer coast is steep and bold.

On the westward side there is a bay in which there is a good deal of fringing and detached reef, on a part of which stands Churakama Islet.

Small craft might possibly find sheltered anchorage in a bight of the reef just northward of this islet.

The northern end of Njapuana is low on the western side, with a sandy beach fringed with coconut trees. There is a break in the barrier at this point forming the outer part of Tongoro entrance to Kolo and Marovo Lagoons.

Pori Pori Island, $4\frac{1}{2}$ miles long and the next outer barrier island to the northward, is steep-to and bold like the others on its sea face, but for the greater part of its inner side it is flanked with a reef which grows increasingly wider to the northward, near the edge of

which stand several small islets. This reef is steep-to on its inner or channel side.

Njapi Njanjamo Island, the inner barrier island abreast Pori Pori, has a fringing reef along its whole length, also steep-to. Off its northern extreme is an islet connected to it by a sand flat which is nearly awash. From thence a reef covered a few feet extends northward to and $\frac{1}{2}$ mile beyond the Kopinai Islets. Some detached patches lie off its north extreme.

The passage between Pori Pori and Njapi Njanjamo, with its reef extension, is deep and leads to the Kokwana entrance of Marovo Lagoon and to the inner waters.

Matui Island.—At Matui Island, northwestward of Pori Pori Island, the barrier commences to trend away to the westward. The island is $2\frac{3}{4}$ miles in length with a bold sea face, steep-to, and ends somewhat suddenly, the reef thence continuing awash to the Tambaka Islets.

Pirikale Island is situated on the barrier reef westward of Tambaka Islets. Westward of it is Lumalihe Island, and between is the Lumalihe entrance to the lagoons.

Lumalihe Island is $1\frac{1}{2}$ miles in length and bold to seaward. From it the barrier reef and islands continues its westerly direction, gradually decreasing their distance from the shore, with numerous breaks in their continuity, and a few entrances for small craft and boats, some of which have been examined, are described in the following pages.

Kemu Island, 250 yards in length, is situated just westward of Lumalihe Island, and from it to Karikana, the next island, the reef is nearly awash and always visible, with the bold islets of Petu on it.

Karikana Island is $2\frac{1}{4}$ miles in length and wooded, with a steep slope to seaward. Between it and Matenana Island is Karikana opening.

Matenana Island, 1,200 yards in length, is the next island to the westward. Between it and Charapoana Island are Matenana and Embolo, two small openings, with Embolo, a small island, separating them.

Charapoana Island, 1 mile in length, is on the eastern side of the Charapoana entrance, which divides it from Uepei Island.

Charapoana entrance, 200 yards wide, is bold on both sides. On opening the passage the two small islands of Ngoeti will be seen with a sandy beach between them.

Ueppi Island, $1\frac{1}{2}$ miles in length, has a sloping wooded shore, with a coral cliff on its most salient point, where it curves in toward Landoro opening.

Landoro opening is 200 yards wide, with a reef across it studded with boulders.

Inawo Island, about a mile in length, is on the western side of Landoro opening, and between it and Avavasa, the next island, there is the small opening of Iudinkana, only visible as a depression in the line of trees, through which there is a canoe passage.

Avavasa Island, $2\frac{1}{2}$ miles in length, has a small indentation near its center blocked with reef which has a wooded islet on it. There is a native track here to the inner side of the island.

Barrier reef and islands.—Continued on subsequent page.

Kolo and Marovo Lagoons.—The lagoon inclosed by the barrier islands just described is sprinkled with numerous islets, reefs, and shoals, and the navigation is therefore intricate, though the water in several of the entrances, hereafter described, is deep.

It is divided into two main portions by a narrowing which occurs near the Tongoro entrance. Kolo Lagoon, as the southern portion is named, is more encumbered with islets and reefs than the other, which is known to the traders as Marovo Lagoon. The surrounding barrier islands are called Tomba by the natives.

The lagoon which continues on to the westward from Marovo Island for some considerable distance has not yet been examined.

Observation spot (lat. $8^{\circ} 29' 43''$ S., long. $158^{\circ} 9' 51''$ E.).—Within the southern end of Matui, on the northeast barrier, is Charra Islet, the observation station of the British naval vessel *Penguin*. It had a solitary coconut tree growing on it, with a few bushes.

The position as here given depends on telegraph station, Thursday Island being in longitude $142^{\circ} 13' 25''$ E.

Entrances.—Wickham and Bili entrances are the two passages into Kolo Lagoon, and the four entrances into the Marovo Lagoon are named Tongoro, Kokwana, Lumalihe, and Charapoana entrances. There are other passages through the barrier westward mentioned with the barrier islands off the northeast coast.

Kolo Lagoon is 11 miles in length from Wickham entrance to Sivai Island, northward of which it is named Marovo Lagoon. Its breadth is between 5 and 6 miles, narrowing to $2\frac{1}{2}$ miles at the northern end near Sivai Island.

There are 86 islets of various sizes scattered about over its surface, besides very many reefs.

The water between them is in some places 20 fathoms deep and everywhere it is navigable for small vessels, such as are usually employed by traders, if ordinary care be taken. No particular tracks can be given, but as a general rule the water is shoalest for some distance off the shores of Vangunu and Gatukai, and not so much so off the barrier islands.

The entrances, as mentioned above, are the Wickham and Bili, described elsewhere.

The islets in Kolo Lagoon are said to have been fairly well populated in recent years, and some had large villages on them, but by 1893 the population had either died off or moved to the main island to live in the comparative safety of the bush, free from head-hunting, labor traffic, and the terror instilled by the bombardments of naval vessels in the vicinity, which all conducted to this result.

Marovo Lagoon has comparatively few islands in it, and nearly all its dangers are within the 10-fathom curve.

Kowana entrance—Landmarks.—Mount Vongi, 1,655 feet high, is a conspicuous peak when bearing 233°; Mounts Belema and Mangota on that bearing appearing as one cleft peak.

Islands—Settlement.—Lying a short distance off the coast of Repi, and close to one another, are Lilihina and Telina Islands. The former has been entirely cleared of bush, planted with coconut trees, and cultivated.

There is a Government station at Karunohu.

The landing place is between two coral piers on the southern side, and a path leads from it to the trader's house, which is on the flat top of the island and fairly conspicuous.

Telina (lat. 8° 31' S., long. 158° 5' E.) has one or two houses on its northern side and a small coconut plantation.

Other islands inhabited in the lagoon are Karumanaki, near Kokwana entrance, and Utuha and Nuserwa, off the Repi shore.

Pigeons may be found on most of the islets; on Kopinai, near the Kokwana entrance, there is usually a large number.

Tides.—A series of tidal observations was made at Telina Island, which covered the period between August 21 and September 19, 1893. From so short a time no tidal data of any great value can be calculated, but the traders of long standing in these parts declare that the rise of the tide in the lagoon is irregular and largely influenced by wind.

The following generalizations were made:

The extreme range observed between the highest high water and the lowest low water was 3 feet 9 inches. Springs occurred on the days of full and change (latter uncertain). There was only one tide in 24 hours, except near springs, when there were usually two high waters and one low water; and on the days following change there were two regular tides. Low water occurred between 9.30 a. m. and 12.30 p. m. High water occurred between 6.15 p. m. and 9.30 p. m., but its limits were 5.45 p. m. to midnight.

On two occasions, three days before full and one day before change, respectively, there was only a low water (at 10.30 a. m. and 11.30 a. m.), and no high water at all during the 24 hours.

Tidal streams.—The flood stream sets probably to the eastward and the ebb to the westward, the velocity being largely dependent on

the amount of extra water which has been forced into the lagoon over the barrier reef by any strong wind, and the direction on the possibility of its making exit over the barrier instead of by the usual narrow openings.

Directions.—**Tongoro entrance** (lat. $8^{\circ} 34' S.$, long. $158^{\circ} 12' E.$), the southeasternmost, occurs at a simultaneous break in both the inner and outer barriers. It was tried by the British naval vessel *Penguin*, and though it has been but little, if ever, used by naval vessels is probably the least tortuous route to Lilihina Island, the trading settlement.

In 1908 the British naval vessel *Cambrian* entered the lagoon through this channel and found good anchorage in a depth of 10 fathoms at 800 yards eastward of Lilihina Island.

A mid-channel course, steering 254° , will lead through the outer barrier to the inner one, in deep water. The passage between the inner barrier islands, though narrow, is perfectly clear, the small fringing reef on either side being steep-to, and the depth nowhere less than 32 fathoms.

After passing the actual inner barrier islands there is a continuing wall of reef on either hand, that on the northern being usually covered but easily seen; that on the southern partly so. The latter has on it a clump of mangroves, and Worosu Islet, with a wide sandy beach and fringing reef extending off it, which forms that side of the channel, and is steep-to. This reef extends for 1,000 yards westward of Worosu and then southward.

Steering midway between these reefs, a 269° course should then be made for Sivai Islet, which is planted with coconut trees and has a sandy beach all around it. It stands on a reef which connects it with two other islands northward, and the navigator at the masthead can thence distinguish the straight channel which leads northward between this reef and the reef eastward of it.

There is a second deep channel to the westward of Sivai between it and the mainland, passing southward and westward of that islet, the reef extending from which is easily made out. The course thence is 2° until the northeast end of Mbariki is reached.

This channel is nearly twice the breadth of the other, being 800 yards wide in its narrowest part; it has also the advantage of having reef on one side only. The shore line is steep-to throughout.

The Mbarika coast throughout the remainder of the passage to Lilihina Island is steep-to and without fringing reef. Its points may therefore be rounded at an average distance of $\frac{1}{4}$ mile, and through the bottom is uneven and in many places visible the least water known in this track is 9 fathoms.

Anchorage.—On rounding Lilihina Island anchorage may be obtained, in a depth of 14 fathoms, with a small cliff on the western

side of the island, bearing 115° , distant 800 yards. A reef extends 200 yards westward of this cliff.

Kokwana entrance, about 5 miles northward of Tongoro entrance, is between Pori Pori and Matui Islands. It is about 400 yards in width between the steep-to fringing reefs and has depths of not less than 25 fathoms, but is only suitable for short and handy vessels.

On entering the lagoon three islets facing the entrance will be distinguished, namely, Kopinai, Karumanaki, and Karamaho.

There is no proper anchorage here, the depth being nowhere less than 40 fathoms in order to swing clear of the reef.

The inner barrier, as has been already mentioned, here becomes sunken, and is broken up into a succession of patches, but it is possible by careful masthead navigation to steer between them, although the channel is tortuous.

A reef extends northward of the western extreme of Karamaho, but the eastern end is clear and fairly steep-to.

When, therefore, desirous of going to Lilihina Island and being abreast Charra Islet, distant about 400 yards, steer for Lulu Islet until Mount Vongi is in line with the western extreme of Karamaho Island, bearing 224° , when it should be steered for until within about 600 yards of the island. Then steer to pass along the eastern and southern sides of that island at a distance of just over 200 yards, after which a course may be steered straight for Lilihina, which is readily distinguishable by its coconut plantation and the houses on its southern end.

This track leads up in deep water, usually over 20 fathoms. The British naval vessel *Goldfinch* made this route safely and without much trouble, but a less handy or longer vessel would probably find difficulty and danger in threading a passage where so much depends on eyesight and where the changes of course require a quick-swinging vessel.

Lumalihe entrance (lat. $8^{\circ} 28' S.$, long. $158^{\circ} 05' E.$), between Pirikale and Lumalihe Islands, is the northern entrance. It has hitherto been the usual as it is the shortest route to Lilihina from the sea. The entrance is 600 yards wide between the steep-to fringing reefs, and the Pirikale side is bold, while the other is the usual wooded steep slope.

Mangota, a notched peak in the Mbariki Mountains, bearing 177° , leads in mid-channel through the outer part of the passage in a depth of not less than 40 fathoms.

Three wooded islets face this entrance of the lagoon, namely, Sambulu, Balewa, and Matimbaka.

The passage is westward of Balewa, the middle one, and a fairway course should be steered in about 30 fathoms water.

From Balewa a reef, always visible and sometimes dry, extends southward, ending in a tale of dangerous patches.

From Matimbaka, also to the southward, there is a similar reef on which lies a long white sand bank (Matariu) just covered at high water but always showing.

The passage, which is 200 yards wide, leads between these reefs in not less than 27 fathoms water, by keeping the eastern side, to avoid a patch with a depth of 3 fathoms over it, off the western reef.

The channel thence is westward of Utuha Island, and from the masthead the reefs and dangers which surround it may clearly be distinguished. A patch with 5 fathoms water over it lies in the track, and there is another westward of the fairway abreast Utuha and another with a depth of 4 fathoms southwestward of that island.

When Lilihina Island bears 106° steer for it, which course will lead midway between the southern side of Utuha Reef and a long patch lying parallel to the shore southward of it and up to the anchorage in 14 fathoms water, northwestward of Lilihina.

Lumalihe entrance.—In 1911 the British naval vessel *Torch*, when attempting to proceed from an anchorage about $\frac{3}{4}$ mile north-eastward of the northwest end of Warata Island to the Kokwana entrance, passing north of Lilihina Island, came to a reef of about 3 fathoms, situated approximately 900 yards 64° from Warata. No way was seen past it, there being so much shallow water all round of 4 to 6 fathoms that it was difficult to pick out the shoalest spots.

In approaching the anchorage mentioned, from the Lumalihe entrance, it was necessary to pass between two patches of 3 fathoms, 400 yards apart, with deep water between, lying $1\frac{1}{4}$ miles 64° of Warata Island.

Charapoana entrance, 7 miles westward of the Lumalihe, is 200 yards wide, with bold points on either side and deep water in the fairway. On opening the passage the Ngoeti Islands will be seen with a sandy neck connecting them. Anchorage for small craft may be obtained inside, but the swinging room is limited and can not be recommended. The navigation must be by eye, the reefs being generally visible.

Tides.—The establishment is irregular and the extreme range of tide about 4 feet.

Tidal streams.—The tidal streams run strongly through Charapoana Passage, particularly abreast the southern Ngoeti Islet.

Entrances to Marovo Lagoon farther westward through the barrier reef are described a few pages farther on.

Eastern coast of main island.—Continued from prior page.

Tironusa Point (lat. $8^{\circ} 33' S.$, long. $157^{\circ} 53' E.$), nearly the southern extreme of New Georgia main island, forms the western

side of Njai Passage, the southwestern entrance to Marovo Lagoon. It is bold and gradually rises to a summit 600 feet above high water.

Between it and Patumorutu Point to the northward is a narrow bight, into which a stream empties itself.

Pondokong.—Between Patumorutu Point and Chuchulu Point, about $2\frac{1}{2}$ miles to the northward, is a bay with a stream at its head. Its shores are planted with coconut palms, among which can be seen the village of Pondokong.

The natives of Pondokong are friendly and in constant dealing with white traders. There are gardens on the slopes of the hills behind the village on the road to Kutelike Summit, a rather prominent peak, 672 feet above high water.

Supplies.—Taro, papaws, etc., are fairly plentiful and may usually be procured in exchange for articles of barter.

There are several streams in this vicinity, but they are not recommended, as the natives state that the water is unfit to drink.

Coast.—The coast from Chuchulu Point forms a bay $\frac{1}{2}$ mile deep, thence trends northward for 2 miles to Ngari Ngari Island.

Makaleve and Bimbolo are two small settlements on this coast, and these (1895) are the last signs of natives on the coast until the Vaholi district is reached, 15 miles to the northwestward.

The whole of the large bay lying between Pondokong and the opposite Vangunu Coast is strewn with low wooded islets, none of which is inhabited. A few have coconut plantations upon them, and nearly all are fringed with mangroves.

Mindi Mindi Islands.—On some of the Mindi Mindi group of islands off Pondokong are graves and copra-burning sheds. Except in the vicinity of the group the water appears to be deep and free from dangers.

Coast.—From Ngari Ngari Island the coast trends to the northwestward for 8 miles to Piongo Ombo River, forming the sea front of the prominent Karu Mahimba Range, which rises steeply behind it to peaks varying from 1,429 to 2,670 feet above high water.

There is a bay about 1 mile deep formed at the remarkable gap between the Karu Mahimba and Mbateu Ranges. The summit of the latter is Vina Vina, conspicuous and 1,962 feet in height.

Water.—There is no stream in the valley northeastward of Mount Vina Vina, only a sluggish mangrove creek. The Karu Mahimba Range is deeply cleft into precipitous valleys on the northern face, through which run four mountain streams, the entrances to which are wide and easily seen. They each have the same characteristics, being entered over a shallow sand bar, and at the head of an estuary, usually about $\frac{1}{2}$ mile long. The fresh water comes swiftly down over large boulders from the heights above. The water is easily

obtained at any time of tide, and if taken at a little distance up among the bowlders is perfectly wholesome and clear.

The coast in the vicinity of Dorahana River is widely fringed with shallow reefs, rendering it extremely difficult of access, though channels deep enough for a craft of 4 or 5 feet draft may be found here and there.

Lagoon.—The Marovo Lagoon, abreast the Karu Mahimba district, becomes considerably narrower, averaging only $1\frac{1}{2}$ miles in width. It is numerously sprinkled with islands, all bearing the usual features.

Piongo Ombo River, lies between the Karu Mahimba Range and the Hoogho Hills to the northward. It has a wide mouth fronted with mangroves and the usual shallow black sand bar.

Coast.—The coast from Piongo Ombo trends northward for 2 miles, and thence northwest for 3 miles to Sumba Peka Point, which is planted with coconut palms. The shore throughout is fringed with mangroves, and the lagoon, which is here not more than about $\frac{1}{2}$ mile wide, contains no islands for a distance of 5 miles. The water appears to be deep and clear of reef.

Piongo Lavata.—To the westward of Sumba Peka Point is a bay at the head of which is Piongo Lavata, one of the largest streams in New Georgia.

It has a shallow bar, but is navigable to boats for a distance of probably 6 or 7 miles, and has been examined to a distance of $3\frac{1}{2}$ miles. It drains a considerable flat district surrounded by hills, all of which is uninhabited and densely covered with bush.

Karu Motu Island (lat. $8^{\circ} 17' S.$, long. $157^{\circ} 48' E.$).—The whole of this part of the main island is called Vaholi. It may have been well peopled, but, at the time of the survey, the very few remaining inhabitants were living in a bush village named Kererao and on Tanambuso, an islet in the lagoon off Tumiulu Point. This islet is cleared and has a few coconut trees on it, with the houses of the settlement.

A surveying party from the British naval vessel *Penguin* was camped here for some time on Karu Motu, an adjoining island, and the natives were found to be most friendly, though very poor.

Water.—Fresh water can only be obtained by going about 2 miles up Piongo Lavata.

The lagoon.—There is a scattering of islands of the usual appearance in this part of the lagoon, some of which have coconut plantations upon them.

From Tumiulu Point the land, trending northward for a distance of $2\frac{1}{2}$ miles, is low and thickly fringed with mangroves. Tomba Kokorapa, a large island, occupies this widened part of the lagoon

and the narrow strait between it and the mainland on one side and the barrier island, Mondo Mondo, on the other are only passable to small boats, thus preventing further navigation northwestward through the lagoon.

The land here turns sharply northwestward for $3\frac{1}{2}$ miles and the lagoon is almost clear of islands for this distance. The first portion, named Konggu, is about a mile wide, afterwards narrowing to about $\frac{1}{2}$ mile, and abreast Pipa entrance, about 3 miles northwestward of Tomba Kokorapa, the lagoon is deep, but soon shoals to the westward.

Manoholima Island.—The land abreast Mbaho opening, $1\frac{1}{2}$ miles northwestward of Pipa entrance, turns to the westward for $1\frac{1}{2}$ miles, and here the lagoon is almost entirely blocked by Manoholima Island. The narrow passages on each side of this island are shallow.

The lagoon then opens out to a width of $2\frac{1}{2}$ miles, which portion is named Grassi Lagoon, and contains but one islet, Malavari, situated about the middle, with a trader's house on it.

There is a deep channel leading up to this island from Lolomo entrance, $1\frac{1}{2}$ miles northward of it, which is used by the trading schooners, otherwise the lagoon is encumbered with shoals and unnavigable for anything but boats.

Coast.—Abreast the western end of Manoholima Island is the mouth of the Hombala, a fair-sized stream, coming down from between the slopes of Evorai and Dubatina Mountains. It is navigable from the entrance for about a mile for small boats, but after heavy rains it becomes so swollen as to render this impossible.

This river is not shown on the chart.

From Manoholima Island the coast trends southwest for $2\frac{1}{2}$ miles to Helingeri Inlet, into the head of which flows the Tomaka River, of about the same size as the Hombala, above mentioned. There is also the Tambi stream, which flows into a shallow bay nearly a mile to the eastward.

Ravetti Inlet (lat. $8^{\circ} 14' S.$, long. $157^{\circ} 38' E.$).—From the Tomako River the coast has a general westerly direction to Ravetti Inlet, which is nearly 2 miles deep, with a stream flowing into the head of it. The mouth of the inlet is a mile wide, and from thence the coast trends northward to Inato Point.

The Grassi range of mountains, which rises in steep and densely wooded slopes behind the coast line just described, has many peaks, the most conspicuous, from the northwestward, being Mangela, 2,037 feet above high water, but as the coast is approached this is lost behind the nearer hills. Of these, Dubatina and Evorai, of 1,445 and 1,374 feet above high water, respectively, are the most easily distinguished.

Mbarego Hill is saddle-backed, with two peaks of nearly equal height, viz, 1,043 and 1,030 feet above high water. The lower and southern one is marked by a conspicuous tree.

Mbara Hills, the highest part of which is 1,666 feet above high water, slopes down in a ridge to Inato Point, terminating there in Inato Hill, a rounded hill 380 feet above high water.

Ramada is, except a small one named Alelu, at the head of the Ravetti Inlet, the only village on the shores of the Grassi Lagoon. It contains from 100 to 150 people.

Men from the bush were met with in the lagoon, but only one bush village was seen, that being in the Mbara Hills, and that only from the summit of Dubatina.

Supplies.—The natives in this part were very friendly and brought for barter to the *Penguin's* surveying party considerable quantities of fruit and vegetables, as well as fish, they being keen fishermen. Of the vegetables the principal were papaws, sweet potatoes, bananas, taro, and occasionally pineapples.

The chief, who lived at Ramada in 1894, provided men for portage and clearing the bush.

The greater number of plantations were on the banks of the Hom-bala River, which are in parts well cleared. Here also are plats of sugar cane, but of which no use is made.

Water.—Fresh water may be obtained from any of the before-mentioned streams, the Hombala offering, perhaps, the greatest facilities.

Barrier reef and islands.—Continued from prior page.

Lopachanai opening, between Avavasa and Tetama Islands, is narrow but admits boats at high water.

Tetama Island, on the eastern side of Mongo entrance, is 2½ miles in length, with sloping wooded sides and occasionally bold.

Mongo entrance (lat. 8° 21' S., long. 157° 53' E.), 200 yards wide, between the reefs on either side, separates Tetama Island from Tambangowari Island. Ngusi Ngusi, a low mangrove island, is situated on the reef forming the northern side of the entrance. The British naval vessel *Penguin* anchored off Mongo Islet, in a depth of 29 fathoms but had barely swinging room. The tidal streams run strongly in the entrance.

Tides.—The establishment is irregular and extreme range of tide is 4 feet.

Nduhiri Passage separates Tambangowari Island from Kotukuriana Island. It is narrow and blocked by reef.

From Nduhiri Passage the island of Kotukuriana, 4½ miles in length, extends to Lingutu entrance, forming its southern side.

Lingutu entrance is a clear deep passage, 300 yards wide, between Kotukuriana and Mondo Mondo Islands. Kiriana Island faces the inner side of the entrance.

Directions.—To enter, steer with that island bearing about 264° through the fairway and anchor in from 20 to 30 fathoms water northward of the island or in a depth of 19 fathoms southward of it. Floods at times cause a current outward through the passage.

Mondo Mondo Island, which is on the northern side of Lingutu entrance, trends northward for $2\frac{1}{4}$ miles to Hohopo Point, forming, with Kotukuriana Island, Vaholi Bay, with Lintugu entrance at its head. From Lingutu entrance for a mile to the northward is an outer fringe of reef 400 yards offshore, with deep water inside but no apparent entrance. On this reef there is a conspicuous islet named Hoto, covered with coconut trees, and there are also several coral boulders with bushes on them.

Hohopo Point, the eastern extreme of Mondo Mondo, is steep to outside the shore line of reef, which projects only 150 yards and is bold on its eastern side. From it the coast of Mondo Mondo turns northwestward for $3\frac{1}{2}$ miles to Tusu Kaka Island, to which it is joined by a reef. The reef fringing the shore for the whole distance is studded with coral boulders, and in one place there is a small reef-inclosed bay, with a wooded islet in it.

Tusu Kaka Island, 1,200 yards in length, is on the eastern side of Bakelai opening, which is $\frac{1}{2}$ mile wide and completely blocked by a reef always visible.

Pipa entrance.—**Hungimo Island** separates Bakelai opening from Pipa entrance, which is 250 yards wide and faced by Meganara Islet.

In entering, mid-channel should be kept, passing westward of Meganara, off which, at the distance of 200 yards, there is anchorage in a depth of 20 fathoms.

An island $1\frac{1}{2}$ miles in length separates Pipa entrance from Mbaho opening, which is 200 yards wide and blocked with reef.

Hopasei Island, $2\frac{1}{4}$ miles in length, extends between Mbaho and Hopa Seki openings.

Hopa Seki opening is blocked with reef on which stands an islet.

Busambusa Island, 1.3 miles in length, between Hopa Seki and Lolomo entrance, is bold to seaward. The outer fringe of reef has several boulders on it, most of which are near the western end. This reef extends about 150 yards from the western end of the island.

Lolomo entrance (lat. $8^{\circ} 11' S.$, long. $157^{\circ} 41' E.$), 200 yards wide between the reefs, has a clear passage and is faced by Keru Island.

To enter, steer in with the center of Keru in line with Dubatina Peak, bearing 164° , which leads between the reefs.

There is anchorage for small craft between Keru and Ramada Islands, but it is advisable to moor, head and stern, with a line to the trees on Keru. Reef extends off the western end of Busambusa and off the southern end of Ramada. The British naval vessel *Penguin* (1894) moored in a depth of 18 fathoms between these islands and rode out a strong breeze from northwestward with very little sea.

Ramada Island, 2.3 miles in length, lies between Lolomo and Vera Vera entrances and forms Ramada Bay. At 670 yards from its western end is the village of Ramada. The village is on both sides of the island, the principal number of houses being on the inner side. On the seaward side there is a coral limestone cliff 45 feet above high water, on the top of which is a house, with an old stone stockade fort just to the westward of it.

Vera Vera entrance, used by trading schooners, is 200 yards wide. There is anchorage, in from 15 to 22 fathoms water, between the entrance and Tongo Island. The Ramada Island side should be kept, as the reef extends nearly 200 yards from the northern shore.

Vina Roni Hill bearing 268° leads through the passage between the reefs.

Barrier reef—Islands.—From Vera Vera entrance the line of barrier trends northward for $6\frac{1}{2}$ miles in a succession of islands and openings, but with no navigable entrance.

Tandoki opening, the first of these, may at once be recognized by the cliffs on each side and two bold islets which stand on the reef in the opening.

Paili opening, the second one, has Singo Belema Island just inside it. The growth of the trees on this island give it a grotesque appearance.

Tokovai opening, nearly a mile northward of Paili opening, has a charted depth of $1\frac{1}{2}$ fathoms.

All these barrier reef islands are densely wooded, even topped, and from 100 to 150 feet above high water.

Langdale Point, the northern extreme of New Georgia, is apparently an evenly rounded point. It and the coast on either side for about 15 miles has not been surveyed.

Rice anchorage (lat. 8° 08' S., long. 157° 19' E.), on the eastern shore of Kula Gulf, and nearly 15 miles southwest by south of Langdale Point, is about $\frac{1}{4}$ mile in width between its southern entrance point and the reef that extends 400 yards southward of Rice Point, on the northern side of the entrance.

It affords anchorage in a depth of about 20 fathoms over mud. The eastern shore is fronted by a bank of sand and mud to the distance of about 400 yards and a stream discharges at its head. The shore is densely wooded.

Tides.—The tides are irregular and the approximate range is about 3 feet.

Kolieuro Inlet is situated about 3 miles southward of Rice anchorage, and a vessel will be abreast the entrance when the square-topped peak of Kulambangra bears about 292° . The inlet is about 2 miles in length, 400 yards in breadth, and the same width in the entrance, which is fronted by reef to the distance of from 200 to 400 yards.

The channel between the shoal water extending from Transit Point and the point opposite it is only about 100 yards wide, but the water is deep. Transit Point should be kept aboard to avoid the shoals fronting the opposite shore. From abreast Bee Point haul to the southeastward to avoid the reef extending from Danger Point.

Anchorage.—There is good anchorage in the fairway above Bee Point, in 12 fathoms water, over mud, with Danger Point bearing 266° , or farther up the inlet, in a depth of 8 fathoms, southward of Jay Point. The shores are chiefly mangrove, backed by densely wooded land.

Hathorn Sound, at the head of Kula Gulf, is the northern part of the channel which separates Wana Wana from the main island, the southern portion being named Diamond Narrows. It is used by vessels trading to Rubiana Lagoon, of which it is the northern entrance.

Anchorage.—The general depth of the sound is, in most places, too great for anchoring, but anchorage may be taken in a depth of about 20 fathoms westward of Cutter Island; in 17 fathoms water with Pinnacle Island bearing 98° distant 400 yards; or farther south in depths from 7 to 10 fathoms, southwestward of Pinnacle Island, avoiding the charted dangers extending off and between those islands.

Directions.—On making Hathorn Sound from the northward, Round Hill, about 250 feet above high water and even topped, is a good mark to steer for. It is the highest land in the neighborhood, and is situated on Wana Wana close westward of Hathorn Sound. A midchannel course should be steered, taking care to avoid an elbow of reef which projects off Cutter Point, by borrowing on the Wana Wana shore, the reef on that side being fairly marked by islets and cays.

Diamond Narrows (lat. $8^{\circ} 16' S.$, long. $157^{\circ} 12' E.$) are deep and not too narrow for a handy sailing craft, but as there are several sunken rocks at the southern part this channel can not be recommended to large vessels, or to any vessel without a bright sun in a favorable position for seeing shoal water, unless thoroughly ac-

quainted with the locality. The deep water is near the eastern shore throughout.

The southern part is named Swinger Channel, and has Keast Rock, on which the depth is 3 fathoms, in midchannel in the southern approach. From abreast Munda Bar, the southern entrance to Rubiana Lagoon, follow the direction given for it elsewhere.

Tides.—It is high water, full and change, in Hathorn Sound at about 7h.; springs rise 2 feet, neaps range 1 foot.

Tidal streams.—The tidal streams run with considerable strength through Diamond Narrows, but a vessel anchored in Hathorn Sound would not feel them.

Veka Vekalla or Gore Gore (Vella Lavella Island) forms the western side of Vella Gulf, and is charted as being about 26 miles in length in a north-and-south direction by about 8 miles in average breadth. It attains a height of about 3,000 feet above high water, and is wooded. None of its peaks are conspicuous, but some are dormant volcanoes.

The interior is hilly and densely wooded. The coast is indented by numerous small bays, where only trading shooners can find indifferent anchorages.

Eastern side.—Southward of Goava Point, the eastern extreme of the island, there is a village. To the northward are three bays, the second is named Bunasao and the northernmost Surumbi. In both of these there are large villages.

Missions.—Several mission stations are established on the coast of Veka Vekalla, the most important being Vaitasoli on the south coast and Mundi Mundi on the northwest side.

Trading stations.—Joroveto, Mumea, Sungerama, and Juno are situated on the east coast; Lambu Lambu, Sirumbai, Kumbuliu, Boko, Kokolopi, Java, Paraso, and Dobeli are situated on the north-eastern coast. At Paraso there are hot sulphur springs and extensive sulphur deposits at 1 mile inland.

Liapari Island, which is planted with coconut palms and is the residence of a British trader, is situated on the reef extending from the south point of Veka Vekalla. Barambatu and Karokuni Islets are situated on the same reef northward of Liapari Island.

Kalanga is a small island, with a rock about 200 yards off its south extreme, situated northward of Karokuni Island, and between them is a passage leading to the anchorage off Vaitasoli.

Oyama Island, planted with coconut palms, is situated about $\frac{3}{4}$ mile northward of Vaitasoli, and affords slight protection to an anchorage for small vessels off its northwest side in a depth of 14 fathoms.

Matti Shoals, with depths of 4 fathoms, and probably less, are situated about $\frac{3}{4}$ mile from the shore at about $2\frac{1}{2}$ miles northward of Oyama Island.

Shoals.—From Sumbulai Point to Kundurum Bangara (Goava) Point the coast is reported to be clear of offlying dangers beyond a distance of 1 mile, but from about 2 miles northward of Goava Point to Soreyaru (Dobeli) Point extensive shoals, several of which frequently break, are reported to extend 5 miles from the shore.

Vessels should not approach the coast in this vicinity within a distance of 6 miles.

The north coast of Veka Vekalla between Soreyaru Point and Sokovovi (Spot) Point is reported to be free from offlying dangers beyond a distance of 1 mile from the shore.

Java Bay, on the northeast side of the island, was entered by the British naval vessel *Goldfinch* in 1893, for the purpose of hoisting the British flag. A course 255° was steered for the northern end of the bay, which led in between reefs which extended about 3 miles off and nearly up to the coast, when the vessel was headed southward for the center of the bay. Depths of from 20 to 30 fathoms, over sand, were found here, the shore being fringed by reef to the distance of 200 yards. The hills around were well cultivated, but the natives fled on the approach of the vessel. A considerable amount of foul ground was found to exist on both sides of the back in, which is not shown on the chart.

Dobeli Bay, northward of Java Bay, affords confined anchorage in very deep water. No bay is shown here, but Dobeli Point is the northeast extreme of the island.

Worumburi Bay.—Several conspicuous rocks are situated on the shore reef, which is indented by several small bays, that known as Worumburi, situated about 2 miles westward of Soreyaru Point, affording anchorage close to the shore in depths of from 10 to 15 fathoms.

Mundi Mundi.—This large mission station is situated about $2\frac{1}{2}$ miles in south of Sokovovi Point. The anchorage, in a depth of 16 fathoms, is off the mouth of a small river, somewhat protected by two small islands.

Caution must be used, as several foul patches exist in the vicinity of this anchorage.

Coast.—From Mundi Mundi to Sandfly Bay the coast is fronted by reefs and foul ground, extending about 3 miles southwestward of Cape Middleton.

Among these reefs are some narrow passages available for small craft proceeding to the trading stations of Jurio and Vella.

Coconut Islet, small and covered with coconut palms, is situated $2\frac{1}{2}$ miles south of Cape Middleton.

A fringing reef, on which are three islets, fronts Sandfly Bay, to the southward of which the coast is free from offlying dangers, except a patch of 5 fathoms situated about $\frac{3}{4}$ mile 345° of Sirulando (Bagga) Point.

Between Sirulando Point and Sumbalai Point are situated the trading stations of Malasoga, Sipirupi, and Sakasukuru. Near Malasoga is the mouth of the largest river in Veka Vekalla. It is navigable by boats.

Turovilu (Renard) Island.—This island, situated about 3 miles southwestward of Sandfly Bay, is about 300 feet high. A trader is resident on the island.

Shoal patches of 4 and 5 fathoms are reported to exist at about 2 miles westward of this island.

Bagga Island.—This island, 500 feet high and uninhabited, is situated about a mile southwestward of Turovilu Island. It is surrounded by fringing reefs, extending about 1 mile from the coast on the northwestern side, and narrowing to a breadth of 200 yards on the southern side.

From the eastern point the reef extends $\frac{3}{4}$ mile, and has two small islets upon it, the outer of which is known as Fairway Island.

Binskin Island, the residence of a trader, is situated 1 mile northwestward of Fairway Island.

Anchorage.—Fairly good anchorage for a large vessel may be found in a depth of 19 fathoms at about 800 yards northward of Binskin Island; small vessels can anchor on either side of that island near the shore.

Tides.—In June, at full moon, it was high water at Binskin Island at 1h., the rise of tide being about 5 feet. Strong tide rips and tidal streams attaining a velocity of 4 knots are experienced in this locality.

Beagle Channel.—This channel, between Turovilu (Renard) Island and Bagga Island, should not be attempted unless the sun is in a favorable position, as the existence of some foul patches has been reported.

It is advisable to keep near the southern side.

Strong tidal streams are experienced, attaining at springs a velocity of 4 knots. The streams set to the northward and southward.

Wilson Strait separates Veka Vekalla and Ronongo Islands and joins Gizo Strait to the eastward.

This strait is free from dangers, and the shore on either side may be approached to a distance of $\frac{1}{2}$ mile.

The western approach to this strait is clear, but at times strong tide rips are met with. It is advisable to keep within a mile of Bagga Island.

Reef Island, situated about 4 miles northwestward of the north end of Ganonga Island, is 40 feet high and surrounded by a fringing reef extending 670 yards eastward from it and 2 miles to the westward.

Several small sand cays are situated on this reef, which generally breaks heavily.

From the western extremity of this reef foul ground, with numerous shoal patches, extends about 4 miles in a southeasterly direction. These shoals only break in heavy weather.

Ganonga (Ronongo) Island is charted about 13 miles in length in a north and south direction. 5 miles in breadth, and is about 2,000 feet in height.

This island is reported to afford no good anchorage for even small vessels, as a heavy swell is generally experienced on all sides.

With the exception of low land at the northern and southern extremities, the interior is covered by hills, attaining a height of from 1,000 to 2,000 feet.

There are numerous mission stations on Ganonga, principally situated at the southern part of the island.

Coast.—The northern side of Ganonga Island is fringed by reefs extending from $\frac{1}{2}$ to $1\frac{1}{2}$ miles from the coast. Near the eastern edge of these reefs is situated Pacific Island, a small island 50 feet high.

A large detached shoal is situated about 600 yards east of Pacific Island.

The eastern side of Ganonga Island is steep-to, and the principal villages are those of Dai, Pilo Pilo, and Olilavata.

Temporary anchorage may be found in Koreovuka (Emu) Harbor at 1 mile southward of Pacific Island, and at Kumbokota, northwestward of Inijaru Island.

The west coast of Ganonga is steep-to, with no offlying dangers; it forms a bight, at the head of which temporary anchorage in a depth of 12 fathoms may be found off the village of Ge-eura.

Anchorage can also be found off Lunga mission station, north of Cape Satisfaction (Lunga Point), southward of Ganonga village and eastward of the reef extending north from Vori Point, the northwestern extreme of the island.

Tides.—Strong tidal streams and current are experienced in the vicinity of Ganonga Island, and at from 5 to 10 miles westward of it a strong set to the southwestward is frequently found, even during the southeast monsoon.

Cape Satisfaction, the southern extreme of Ronongo, is reported to lie 221° , distant 3 miles from the position charted.

Palaina anchorage (lat. $8^{\circ} 00' S.$, long. $156^{\circ} 32' E.$).—There are two or more anchorages off its western side, the northernmost being

named Palaina, where there is exposed anchorage in a depth of 12 fathoms.

Tides.—It is high water, full and change, in Palaina anchorage at 5h.; springs rise 4 feet (approximate).

Narovo (Eddystone) Island, about 7 miles southward of Ronongo, is about 4 miles in length and about 1 mile in average breadth. It is formed of two hilly portions connected by a low narrow neck. With the exception of Simbo Islet adjoining and the narrow neck, which are of upraised coral, the whole island is of volcanic formation. Signs of activity are confined to the southern portion, which contains the more elevated land, Middle Hill and South Hill, rising to a height of 1,025 and 1,100 feet above high water, respectively.

The northern portion is fronted by coral reefs on the eastern and western sides. Off the southeastern portion is Simbo Islet, the channel between which and Narovo is less than 100 yards wide between the fringing reefs.

On the southwest coast, at the foot of the northern slope of the crater (South Hill), there is a salt-water lagoon, which is connected with the sea on its northern side. On the southern shore of this lagoon is a boiling spring, and in its vicinity the water is hot for about 30 yards from the shore. The lagoon contains numbers of alligators.

The channel between this island and Ganonga Island is reported to be free from dangers.

Rocks.—At 670 yards off the southwest coast of Narovo there are two rocks, the highest being 30 feet above high water; 270 yards, north by west from them is a rock awash.

A rock and heavy breakers are charted on the southern side, off the opening between Narovo and Simbo Islands.

Shoals.—At 2½ miles southward of Narovo, with the south peak bearing 353°, is a shoal 600 yards broad and extending 1,000 yards in a north and south direction, with depths of from 7 to 10 fathoms over it.

Between this shoal and the island there is another, extending 1,400 yards in a northwest and southeast direction, 1,000 yards in breadth, with depths of from 5 to 12 fathoms over it. The shoalest part lies with the southern summit bearing 344°, distant 1¼ miles from the island.

Observation spot (lat. 8° 16' 00" S., long. 156° 30' 55" E.).—The position given is that of the bushes on the center of the reef at the entrance, but the island is said to lie 4 miles farther eastward than charted.

Natives.—The natives are friendly, and being well acquainted with many of the islands, are useful as interpreters and pilots.

Water of good quality can be obtained from a small stream at the head of the harbor.

Anchorage.—There is a snug harbor on the western side of Narovo, where anchorage may be obtained in from 9 to 15 fathoms water, completely sheltered from all winds. The entrance lies between an outlying reef, with bushes on it, and the island. During the southeast season baffling winds are experienced under the highland, and sailing vessels should not get too close to the entrance reef. In case of necessity an anchor can be let go in a depth of about 26 fathoms when between the reef and the island.

A patch with 1 fathom water over it lies 311° , distant 200 yards from the west point of anchorage.

Tides.—Only one tide was observed during the day, it being high water about 6 hours, and low water between the hours of 12 and 2, the rise being from $1\frac{1}{2}$ to 2 feet.

Ysabel (Bugotu) Island, lying northward of the Russell Islands and of New Georgia, is about 125 miles in length in a northwest and southeast direction, with an average breadth of about 15 miles. A range of mountains extends its entire length, attaining an elevation of about 3,900 feet above high water in Mount Marescot, about 20 miles from its southeast extreme.

The southern end of the island is named Bugotu by the natives, and is nominally ruled over by a chief living at Sepi village, while the northern end, known as Kia district, is controlled by a chief living at the village of the same name.

Natives.—The island is very sparsely populated, the center being uninhabited, with the exception of a few bushmen living among the mountains. The natives of the island are quite friendly. The inhabited parts of the island are immediately around Kia, in the northwest, and around Vulavu, in the southeast. The southern inhabited district extends from Tapula Islet around the southern end of the island to Thousand Ships Bay.

The only place bush natives were met with by the officers of the British naval vessel *Dart* was at Maringe Lagoon. They were an ill-conditioned lot and very shy.

The natives at Kia and Vulavu frequently exchange visits, traveling from end to end of the island in their canoes, and often spend two or three months away from their villages fishing and catching turtle, etc.

South coast.—**Cape Prieto** (lat. $8^{\circ} 34'$, long. $159^{\circ} 53'$ E.), the southeastern extreme of Ysabel Island, is a bold point. The mountain ranges of the southeastern extreme of Ysabel Island are rugged and steep. The highest, Mount Gaillard (Roba), 1,928 feet, is situated about 3 miles within the cape, while about $4\frac{1}{2}$ miles farther northward is the remarkable saddle of Saikile, 1,333 feet in height,

at the southern end of the Mahaga Range, which can be distinguished from a considerable distance in clear weather.

A coral patch of small extent, with a depth of about 3 fathoms over it, is reported to lie to the southeastward of Cape Prieto at about 1 mile from the shore.

Vittora Island is a small wooded islet, $\frac{3}{4}$ mile in length and about $\frac{1}{4}$ mile in breadth, situated about $1\frac{1}{2}$ miles to the southwestward of Cape Prieto. It is surrounded by a coral reef and is separated by a narrow boat passage from the mainland.

Lagali Rocks, 50 feet above high water, are two small rocks lying 200 yards southward of the southern extreme of Vittora Island and on the edge of the reef.

Tavai Vane Rocks are two rocks 50 feet above high water, which lies 800 yards southwestward of the northern extreme of Vittora Island.

Sepi village is situated on the beach $1\frac{1}{2}$ miles northwestward of Vittora Island. There is no anchorage off the village, though there is fair landing for boats in the southeast season, when the trade wind is not strong.

Soga, the chief of Bugotu, lives here.

Vulavu village is $3\frac{1}{2}$ miles northwestward of Sepi village.

Protectorate.—The British flag was hoisted here and Ysabel declared a British protectorate on August 7, 1900, by the resident commissioner.

Missions.—The Melanesian mission has stations established at Sepi and Vulavu villages.

Saikile village is on the beach at the head of the bay northward of Vulavu and immediately at the foot of the hill of the same name.

Stainer Patch, with a depth of $2\frac{3}{4}$ fathoms over it, is situated in the head of the bay outside the 10-fathom line. It is 670 yards to the eastward of Turtle Point and $\frac{1}{2}$ mile from the shore at Saikile village.

Anchorage.—There is good anchorage for small vessels in the southeast trade season between the village and the Green Rock in a depth of $6\frac{1}{2}$ fathoms over sand and coral.

Directions.—Pass to the northward of the Green Rock and bring Cordelia Point in line with Tully Point bearing 144° , which will lead up to the anchorage. The passage southward of Green Rock is not recommended, as it is hard to distinguish the extreme of the reef on the southern side of the channel.

Tides.—It is high water, full and change, at Vulavu at about 3h. 40m.; springs rise about $2\frac{1}{2}$ feet.

Rua Dika, lying 184° , distant $10\frac{1}{2}$ miles from Cape Prieto, is 50 feet in height, and has small dwarfed bushes on its summit. Shoal

water extends for a distance of 800 yards to the northeastward of the rock. It should not be approached within a distance of 1 mile.

Current.—There is a strong current in the neighborhood at times, uncertain in direction. In May, 1886, the British naval vessel *Opal* found a current setting to the eastward at the rate of 3 miles an hour within a short distance of Rua Dika. It is stated to generally run to the southwestward.

St. Georges Island, $12\frac{1}{2}$ miles long in a northwest and southeast direction by about 7 miles wide, with its southeast end 256° , distant 7 miles from Vulavu, has two flat-topped summits, 1,298 feet and 1,200 feet above high water, with a deep gap between them. The island is uninhabited.

Thousand Ships Bay lies between St. Georges Island and the main island. It is about 10 miles in length by about 4 to 5 miles in width, with depths of from 15 to 30 fathoms, decreasing toward its head, from whence the Ortega Channel communicates with the sea around the northern end of St. Georges Island.

The shore line of Thousand Ships Bay is mostly composed of mangroves, and at the head of the bay the land on both sides is low.

No natives were met with in Thousand Ships Bay to the northwestward of Cockatoo Island.

Cockatoo Island or Lilihigna (lat. $8^{\circ} 30' S.$, long. $159^{\circ} 45' E.$), $2\frac{1}{2}$ miles northwestward of Vulavu, is about $\frac{1}{2}$ mile in length by $\frac{1}{4}$ mile in breadth and 241 feet high, with a reef extending from its northwest extreme for about 1,200 yards. On the eastern side it is practically joined to the mainland by a reef. There is good sheltered anchorage between Cockatoo Island and the shore.

Directions.—To enter, steer in with Mahaga Point in line with a remarkable tree on a saddle between two hillocks bearing 53° , which leads northward of the detached shoal with a depth of 3 fathoms over it, lying about 400 yards northwestward of Cockatoo Island Reef. When the extreme of Ysabel Island to the southward is well open of Sandy Point of Cockatoo Island, 131° , steer for it, to avoid the reef extending northwestward of the latter island. When nearing the anchorage these points should be brought nearly in line and a berth taken up in from 15 to 20 fathoms water, or nearer the island if requisite.

Round Island, a small sandy islet, 117 feet above high water, and covered with casuarina trees, lies $1\frac{1}{2}$ miles to the northwestward of Cockatoo Island, on the northern edge of a coral reef that extends nearly $\frac{1}{4}$ mile to the southward of the island. Between Round Island and the mainland are several reefs and patches.

Douglas Reef, lying about 800 yards southwestward of Round Island, is a small coral patch drying 1 foot at low-water spring tides.

Pigeon Island, 125 feet above water and $1\frac{1}{2}$ miles west by south of Cockatoo Island, is a small sandy islet covered with tall trees. It is situated on the northern end of a reef projecting 800 yards to the southeastward. A detached coral head with 2 fathoms water over it lies about 177° , distant 1,200 yards from the southern end of Pigeon Island. There is good landing on the northern end of Pigeon Island.

Astrolabe Harbor (lat. $8^{\circ} 31' S.$, long. $159^{\circ} 41' E.$), on the eastern side of the southern portion of St. Georges Island, is about a mile in length by 300 to 400 yards in breadth, and is so sheltered that a small vessel in it might be hove down with security. Its shores are fronted by a continuous reef, except on the northern side of the inner portion of the harbor.

The northern entrance point is fringed by a reef to the distance of $\frac{1}{4}$ mile, and the southern side to about 300 yards.

Anchorage.—There is good anchorage in depths of 14 to 15 fathoms westward of the observation spot.

Albatross Bay, 2 miles to the northwestward of Astrolabe Harbor, is about 1 mile in length by about 600 yards in breadth, with general depths of from 12 to 14 fathoms to within $\frac{1}{2}$ mile of its head. Above this there are several isolated dangers. At a distance of 1 mile outside the entrance are several coral patches. The passage between them should not be attempted without the sun being in a favorable position for seeing them.

Anchorage.—Good anchorage may be obtained in depths of from 13 to 14 fathoms about 1,400 yards within steep cliff, the southern point of the entrance, about 300 yards eastward of a sunken rock and 200 yards northward of another.

Ortega Channel, which separates the northern end of St. Georges Island from Ysabel Island and connects the head of Thousand Ships Bay with the sea, is shallow, with depths of only 2 to 3 fathoms, and possibly less, water. The water is very discolored, so it is impossible to detect shoals by sight.

Coast.—From Ortega Channel the coast trends in a northwest by west direction for a distance of 14 miles to Mufu Point, 515 feet above high water, which is a conspicuous headland, and from thence for 25 miles in the same direction to Korrigole Harbor.

Barrier reef.—The whole extent of this coast to Furona Island, 9 miles southeast by east of Korrigole, is fronted by a barrier reef, the outside edge of which varies in distance from $1\frac{1}{2}$ to 5 miles from the coast line and inside which are several small islands.

The channel between the barrier reef and the mainland is navigable, but, as it has not been properly examined, the greatest caution should be used; the eye is the only guide.

Eugene Island (Nainuhana) (lat. $8^{\circ} 19' S.$, long. $159^{\circ} 20' E.$), $1\frac{1}{2}$ miles southward of Mufu Point, is a small sandy islet covered with

trees and with a conspicuous clump at its southern end which is 195 feet in height.

Natives from Vulavu frequently visit the island in search of turtle shell.

Anchorage.—A vessel may, in the southeast trade season, anchor in 22 fathoms water, with Eugene Island bearing 166° , but would have to move away on any sign of the wind shifting to the westward of south by west.

Kolokale and Guara Islands, 343 and 296 feet above high water, respectively, and joined together by a reef, lie 4 miles northwestward of Mufu Point. There is convenient anchorage in a depth of 10 fathoms in the center of the cove formed between them.

The few soundings taken in the channel inside the barrier reefs show the bottom is very irregular and doubtless many shoal spots exist.

Papaga Islands are two small coral islets covered with bushes, 7 miles northward by west of Guara Island. They are 800 yards apart and have both peculiar tall, slim trees 100 feet high growing on them. The northeastern of the two has a reef extending northwest and southeast from it.

Furona Island, about 150 feet above high water, is situated $\frac{3}{4}$ mile from the mainland and $6\frac{1}{2}$ miles northwest by west of Papaga Islands. It lies on an extensive fringing reef which extends 1,200 yards to the southward of the main island.

Anchorage.—There is a good anchorage for small craft inside the shoal water to the northeastward of Furona Island in a depth of 10 fathoms.

Passages through the barrier reef.—The passage through the reef to the southeastward of Furona Island is $\frac{3}{4}$ mile wide and apparently clear of danger.

Besides this one there are several others, the best being the passages on either side of Eugene Island, which are clear, and the opening $1\frac{1}{2}$ miles in width next westward of them.

Depths offshore.—The water is deep outside the reefs, over 100 fathoms being found frequently within $\frac{1}{4}$ mile of the reef, the outside edge of which is always plainly visible.

Coast.—The coast from Furona Island to Korrigole Harbor is low, fringed with mangroves and fronted by an extensive fringing reef which extends from $\frac{3}{4}$ to $1\frac{1}{4}$ miles off it.

Four and a half miles to the westward of Furona Island, and just to the westward of Kobokana Island, is a bay with a sandy beach at its head which is reported to afford good anchorage. It has not been examined.

Manekusune Island, 150 feet above high water, situated near the outside edge of the shore reef 7 miles northwest by west of Fu-

rona Island, is a small round island densely wooded and is a conspicuous object when making this part of the coast from the south-eastward.

A detached reef, nearly 670 yards in extent, lies about 1,200 yards to the southward of the island.

Finuana Island (lat. $8^{\circ} 04' S.$, long. $158^{\circ} 59' E.$), nearly $1\frac{1}{2}$ miles in length, is very low and flat and covered with trees 150 feet high in places. The eastern and northern sides of the island are lined with mangroves while the western extreme is sandy.

The island is separated from the mainland by a narrow channel with deep water, through which the tidal streams run strongly. Rob Roy Point is the name given to the northwest end of Finuana Island.

Korrigole Harbor is formed between Rob Roy Point and the mainland.

Langdale point, the western point of Korrigole Bay, is low and covered with trees. There is a shoal with a depth of $2\frac{1}{2}$ fathoms over it situated 700 yards southward of the point.

Aylen Shoal, with a depth of 2 fathoms over coral bottom, lies 0° , distant 1,050 yards from the northern extreme of Rob Roy Point. It is rarely visible owing to the discoloration by the river of the water in the bay.

Grieve Reef, in the northern part of the harbor, is nearly always breaking. It lies within the 5-fathom curve.

Anchorage.—Excellent anchorage may be obtained in a depth of 7 fathoms, over mud, with Rob Roy Point bearing 240° , distant 1,200 yards, and the gap between Finuana Island and the main open bearing 125° .

Directions.—Sharp Peak, a conspicuous hill 1,592 feet above high water, situated 56° , distant 4 miles from the entrance to Korrigole River, serves as a good guide for the harbor when approaching from seaward.

Korrigole River empties itself into the center of the bay. It is a small and quickly running stream, and wild duck may be found on its upper reaches.

Tides.—It is high water, full and change, in Korrigole Harbor at 5h. 30m. (approximate); springs rise about 2 feet.

Coast.—The coast from Korrigole Harbor trends west-northwestward for 35 miles to Austria Sound, and is fronted by many mangrove islands on coral reefs with shallow passages between them and the land. The outer edges of the reefs are steep-to. It is stated that a canoe can traverse the distance between Korrigole and Kia entirely in smooth water, but this is not quite borne out by the chart.

Mount Noble, 2,141 feet high, is a conspicuous rugged peak 7 miles to the northwestward of Korrigole.

Anchorage.—The only anchorages visited by the British naval vessel *Dart* off this part of the coast were Vearveva and Allardyce Harbor, but no doubt there are others.

Vearveva Harbor, 20 miles northwestward of Korrigole Bay, is small and well sheltered. The British naval vessel *Dart* anchored, in a depth of 17 fathoms, over mud, with a rock 20 feet above high water on the northern side of the entrance bearing 23° , distant 800 yards.

Allardyce Harbor (lat. $7^{\circ} 48' S.$, long. $158^{\circ} 40' E.$) $5\frac{1}{2}$ miles west-northwestward of Vearveva Harbor, affords excellent shelter for a small vessel in 8 fathoms water, just inside the entrance to the cove on the southeastern side of the harbor.

A large vessel would have to anchor farther out, in depths of from 25 to 27 fathoms.

Coast.—The coast to the westward of Allardyce Harbor becomes broken up into deep bays and bights with numerous islands.

Albatross Island has a square, flat-topped summit 620 feet above high water, and is 3 miles in diameter. It is separated from the mainland by the South Channel.

Albatross Island bounds Austria Sound on its northeastern side.

Smart Island, about 500 feet above high water, is 3 miles in length in a northwest and southeast direction and $1\frac{1}{2}$ miles in breadth, and forms part of the western side of Austria Sound and the southern side of Rob Roy Channel.

Long Island, 700 feet high, is $14\frac{1}{2}$ miles in length in an east and west direction and from 2 to 4 miles in breadth, with a very indented coast line. It is separated from the mainland of Ysabel Island by Northwest Channel.

Austria Sound, lying between Albatross Island, Smart island, and the southeastern end of Long Island, has many islands and reefs in it, with deep water between them.

Its south entrance lies between the islets fringing Albatross and Smart Islands, whence it trends northward under the name of Northwest Channel, and then between Ysabel and Barola Islands into Kia Bay; thence through a gap in the barrier reef westward of Kakatina Islands and is named Austria Sound, north entrance.

The middle portion of the sound is apparently only available for boats; but little is known of it.

Barrier islands, nine in number, from 50 to 100 feet above high water, lie on a long narrow barrier reef extending in an east-and-west direction and protect Austria Sound from the southward.

Anchorage.—The best anchorage in Austria Sound is in 19 fathoms water with Chislett Island bearing 30° 350 yards distant.

Tides.—The tides in Austria Sound are irregular; springs rise about $2\frac{1}{2}$ feet.

Rob Roy Channel lies between Long Island, to the northward, and Smart and Langton Islands, to the southward. It is apparently deep, though there are several patches where it connects with Austria Sound. It should be navigated with the greatest caution.

Northwest Channel is a boat passage only, which lies between Long Island and the mainland of Ysabel Island and connects Austria Sound with Kia Bay to the northward and Dart Sound to the westward. It is constricted in one place to a width of from 50 to 100 yards, through which the tidal streams run with great velocity.

Thomson Island, 100 feet above high water, forms the western entrance point to Austria Sound.

From here the south coast of the islands takes a generally north-west by west direction for 13 miles to Clayton Point, the western extreme of Long Island.

Sunken barrier.—A sunken barrier of coral formation, with from 3 to 5 fathoms water over it, begins at Thomson Island, and, taking a westerly direction, gradually increases its distance from the land till on the meridian of Molawobi island it attains a distance of 14 miles from it.

The British naval vessel *Dart* made a partial examination of this for a distance of 21 miles from Thomson Island, but it probably extends much farther.

Nairn Island (lat. $7^{\circ} 40' S.$, long. $158^{\circ} 22' E.$), about 100 feet above high water, situated on the sunken barrier, 6 miles westward of the western extreme of Thomson Island and $2\frac{1}{4}$ miles to the southward of Long Island, is about 500 yards in diameter and has a fringing reef all round it.

Breakers.—The tidal streams run with great force along the sunken barrier and when the trade wind is at all strong causes heavy overfalls and breakers, and, from the *Dart*, that part between Nairn Island and Thomson Island on one occasion appeared at intervals to break right across.

Pasco Passage, $2\frac{1}{4}$ miles wide, and situated 6 miles to the westward of Nairn Island, is the best passage through the sunken barrier. It can be readily found by bringing Clayton Point to bear 16° .

When inside the barrier a course may be steered for Dart Sound.

Dart Sound is the name given to the sheet of water between the northwestern end of Long Island and Barola Island. It connects by the Northwest Passage with Austria Sound to the eastward and also with the passage between Barola Island and the northwestern extreme of Ysabel Island which leads to Kia Bay on the north side of the islands.

Anchorage.—There is good anchorage in a depth of 22 fathoms to the eastward of Gill Island.

Kia is a village on the northwestern extreme of Ysabel Island, and on the eastern shore of a narrow channel connecting Kia Bay to the northward with the Northwest Channel, running into Austria Sound to the southeastward and also connecting with Dart Sound to the westward.

The chief ruling over the western portion of Ysabel Island lives at this village.

Anchorage.—There is fair anchorage, in 22 fathoms water, just to the northward of the village with the next point southward of the village just shutting in. In this position a vessel will be out of the swirl of the tidal streams, but it is a contracted berth and it is necessary to anchor midway between the two points so as to have room to swing.

Directions.—After passing through Pasco Passage if desirous of proceeding through Dart Sound to Kia steer to pass to the westward of the Hansen Patches, and rounding to the northward of them, pass to the southward of Jackson and Stonor Islets; then shape a course between the two patches to the northwestward of Holbrow Island; thence pass through the narrows between Butters and Bartlett Islands, taking care to avoid the $4\frac{1}{2}$ and 5 fathom patches off the northeastern end of Draper Island.

After passing Bartlett Island keep the Long Island shore close aboard until past the 2-fathom patches off Pressey Island and continue along the Long Island shore till abeam of the Alfred Reef, when steer to pass about 300 yards outside the northern extreme of Long Island, thence around Sheldon Point fairly close, to avoid the patch to the southward of Carter Point.

From Carter Point steer as requisite for Kia, observing that the western side of the channel is the more free from danger. A good light is essential when navigating this passage.

Barola Island, $11\frac{1}{2}$ miles in length in a northwest by west and opposite direction and from 2 to 3 miles in breadth, appears from seaward as a continuation of the northwest extreme of Ysabel Island. It has a range of hills running its entire length elevated from 600 to 900 feet above high water.

Barola Island is separated from the northwest end of Ysabel Island by a channel from 400 to 1,400 yards in width, with several islands and coral patches in it, which together with the strong tidal streams make it necessary when navigating it to use the greatest caution. It has been referred to under Pasco Passage and Kia.

The southern side of Barola island is high, and separated from Long Island by Dart Sound, before mentioned.

The northern side is not so elevated and is protected its entire length by a barrier reef situated from 1 to 2 miles to the northward of it, inclosing a lagoon in which are several islands.

Gagi Island, 955 feet high, about 6 or 7 miles in diameter, and of a very irregular shape, lies to the westward of Barola Island, from which it is separated by Popu Channel, which is narrow and can only be used by boats.

The southern coast of Gagi Island is high and bold, while the northern coast is low and broken up into two deep bights.

Mount Beaumont (lat. $7^{\circ} 26' S.$, long. $158^{\circ} 13' E.$), 955 feet above high water, the highest point of Gagi Island, is a conspicuous peak situated $\frac{1}{2}$ mile from the southern coast of the island.

Cape Denne, the southwestern extreme of Gagi Island, is a bold headland connected by a ridge of hills with Mount Beaumont. A pinnacle rock, 70 feet above high water, stands out from the cape, but it is connected with it by reef, which is dry at low water.

Molakobi Island, 355 feet above high water, is the largest of a group of nine islands to the westward of Gagi Island and separated from it by the Kologilio Passage.

Bates Island, a low, flat island covered with trees from 40 to 70 feet above high water, is 3 miles in length, and separated by a narrow strip of water from Gagi Island. It appears from seaward to be part of that island.

Cape Comfort is the northwest extreme of Bates Island, which is situated about $\frac{1}{2}$ mile off the northwest side of Gagi Island and parallel to it.

Sukini Reef, to the northward of Molakobi Island, has a northwest by west and southeast by east direction for a distance of 8 miles, and is separated from Cape Comfort by the Kologilio Passage.

There are three small islets, from 70 to 115 feet above high water, situated near the northern edge of the reef.

Dugay Shoal, with depths of from $2\frac{1}{2}$ to 5 fathoms over it, extends 2 miles to the eastward of Sukini Reef.

Kologilio Passage, lying between Gagi Island to the eastward and Molakobi Island and Sukini Reef to the westward, is 900 yards in width at its narrowest part between the 10-fathom curves. Numerous islets and reefs fringe the passage on both sides, and it should be navigated with caution.

Perigo Shoal, a dangerous coral bank, with about 3 feet water over it, lying on the eastern side of Kologilio Passage and $\frac{3}{4}$ mile southwestward of Cape Comfort, is a little over $\frac{1}{4}$ mile in diameter and nearly round. It is generally noticeable by the heave of the sea over it.

Twin Islets, 70 feet above high water, are two small rocky islets covered with trees and closely resembling one another, lying near the edge of the extensive fringing reef to the westward of Gagi Island.

Remark Islet is a small islet lying near the northern edge of the same fringing reef, with a very remarkable tree, 80 feet high, growing on it.

Soundings.—The bottom of Kologilio Passage is very uneven, the depths in the channel ranging from 12 to 40 fathoms.

Tidal streams.—In Kologilio Passage the tidal streams run at rates of from 2 to 4 knots at springs, the flood stream running to the southward and the ebb to the northward. It is slack water at about half tide by the shore.

North coast (lat. $7^{\circ} 20'$ S., long. $158^{\circ} 12'$ E.).—The coast from Cape Comfort trends in a southeast by east direction for a distance of $6\frac{1}{2}$ miles to Port Praslin, and is low and covered with trees. It is intersected by two deep bights or lagoons and from 2 to 3 miles in length, with narrow entrances.

The western lagoon is connected by a narrow channel with Kologilio Passage.

Port Praslin, the third opening to the eastward of Cape Comfort, separates Gagi Island from Marianne and De Surville Islands, and has a narrow entrance. A vessel should keep the eastern reef aboard when entering, and when past the entrance points alter course to the westward and anchor in the center, in from 16 to 17 fathoms water.

Barrier reef.—From Port Praslin the barrier reef commences, extending eastward almost parallel to the northern shore of Barola Island, inclosing a lagoon from $1\frac{1}{2}$ to 2 miles in width, which connects with Port Praslin to the southward of De Surville Island and also with the Popu Channel. The lagoon has not been properly examined, but it contains some good navigating water.

Islands.—There are several small islets on the barrier reef, all being low and wooded, the height of the trees being from 40 to 90 feet.

Austria Sound—North entrance.—Kia Bay is approached through the northern entrance to Austria Sound, which is a break in the barrier reef $\frac{3}{4}$ mile wide $8\frac{1}{2}$ miles from Port Praslin, and almost opposite the passage between Barola Island and Ysabel Island, described with Pasco Passage and Kia.

The water is deep all over the bay, the only anchorage being just to the northward of Kia village in a depth of 22 fathoms, and midway between the two points of the cove with the point to the southward of the village just shutting in.

Tides.—It is high water, full and change, at Kia village at 3h. (approximate); springs rise about 5 feet.

Kakatina Islands are very low, being from 15 to 20 feet high, and composed of scattered mangroves situated on the barrier reef on the eastward side of the northern entrance to Austria Sound.

Ketahatd Island, 137 feet high, lies on the southern side of the barrier reef, about a mile to the eastward of Kakatina Islands.

Passage.—There is a good passage through the barrier 2 miles to the eastward of Ketahatd Island, which might be useful to a vessel bound to Kia from the eastward. The lagoon between the passage and Kia has not been properly examined, and so should be used with caution.

Mount Walker, 903 feet high, is a conspicuous peak, $1\frac{1}{2}$ miles to the southeastward of Kia village, and is a good mark for this part of the coast. It has a large banyan tree growing on its summit.

Wreck Point is the northern extreme of Ysabel Island and is a very low mangrove point.

Coast.—The coast from Wreck Point trends in an easterly direction for a distance of 10 miles, when it turns to the northeastward for 2 miles to Cape Neilson. The coast line is a series of small bays and points, and is well protected by the barrier reef trending parallel with it and inclosing a lagoon from 2 to $2\frac{1}{2}$ miles in width. The land, like the southern side of Ysabel Island, is densely wooded.

Cape Neilson, 12 miles eastward of Kia Bay, is a sandy point and forms the southern entrance point to Rekata Bay. A reef is charted as extending about 400 yards off Cape Neilson.

Gijunabena Islands are a group of low islands of various sizes extending in a southeast and northwest direction for a distance of $12\frac{1}{2}$ miles and standing on the same reef, with shallow water in places between them.

Their northwestern extreme lies 19° , distant 5 miles from Cape Neilson.

Rekata Bay, lying between Gijunabena Islands and the mainland of Ysabel Island, is 7 miles in length and from 2 to 3 miles in width. It may be navigated with caution.

Penrose Patches, $1\frac{1}{2}$ miles in length and lying in nearly north-and-south direction in the center of the entrance to Rekata Bay, are difficult to see. The passage to the southward of them is to be preferred.

Taimihaja Island (lat. $7^{\circ} 35' S.$ long. $158^{\circ} 40' E.$), 100 feet above high water, lies $\frac{1}{2}$ mile off the coast, about midway along the southern side of Rekata Bay. It is of small area, with a fringing reef all around it.

Anchorage.—The British naval vessel *Dart* anchored in a depth of 14 fathoms, over mud, 1,200 yards to the northwestward of the island.

Coast.—The coast at the southeastern end of Rekata Bay projects to the northeastward, forming a sharp, low, and densely wooded point and leaving only a narrow passage between it and the center of

the largest island of the Gijunabena Group. From this point the coast has a southerly direction for 2 miles and then trends away in a southeast by east direction for 17 miles to Cape Megapode, forming a shallow bay.

Sunken barrier.—From the southeastern extreme of the Gijunabena Group a sunken barrier continuing in the same direction as the Gijunabena Reef stretches for 12 miles, joining up with the land 3 miles to the northwestward of Cape Megapode, and forming an extensive lagoon $2\frac{1}{2}$ miles wide inside it. When a heavy swell is running, the barrier breaks at intervals. No passage through it was observed from the British naval vessel *Dart*.

Coral patches.—Three small coral patches, with depths of from 2 to 3 fathoms over them, were noticed from about 1 to $1\frac{1}{2}$ miles outside the sunken barrier, the northern one being $5\frac{1}{2}$ miles to the northwestward of Cape Megapode as charted.

Cape Megapode, a low rounded point, is densely wooded. From it to the southeastward as far as Maringe Lagoon the coast is fronted by dangerous reefs and patches, which, owing to the water often being very discolored after heavy rains, are very difficult to discern. A stranger passing up the coast and not wishing to call at Estrella Bay, would do well to keep outside them. Northward of the land about Kesua Cove these patches extend for a distance of $5\frac{1}{2}$ miles from the shore. Their positions will be best seen by reference to the chart.

Mount Gaterre, a conspicuous double peak, 1,770 feet above high water, situated 5 miles west-southwestward of Cape Megapode, is an excellent mark for this part of the coast.

Coast.—From Cape Megapode to Estrella Bay, a distance of 15 miles, the coast is broken up into several bays, offlying which are numerous islets, reefs, and shoal patches extending to a distance of from 5 to 6 miles from the shore.

Moumolu Island, 100 feet above high water, $1\frac{1}{2}$ miles southeastward of Cape Megapode, is small and well wooded, and stands on the southwestern corner of an extensive reef. This island is a breeding ground for bush fowl (*Megapodiidae*) that visit the island in large numbers and bury their eggs in a huge mound, leaving the heat of the ground to hatch them. A party from the British naval vessel *Dart* dug up upward of 200 eggs out of the same hole, also a number of chickens, two of which were fully fledged and able to fly.

Forrester Island (lat. $7^{\circ} 49' S.$ long. $159^{\circ} 00' E.$), a mangrove island, 40 feet above high water and $\frac{1}{2}$ mile in diameter lies to the southward of Moumolu Island, from which it is separated by a channel nearly 400 yards in width.

Anchorage.—A vessel will find secure and comfortable anchorage in 15 fathoms water, over sand, to 400 yards to the westward of Moumolu Island.

Directions.—To pass between the shoal ground off Cape Megapode and the Moumolu Island Reef, bring the western extreme of Forrester Island to bear 181° , which will lead between the dangers and up to the anchorage in a depth of not less than 8 fathoms.

Caution.—The channel is confined and a good lookout is necessary. The Moumolu Reef generally shows plainly, and it is safer to keep slightly on that side of the passage.

The route from Moumolu Island to Estrella Bay passing inside the Hammon, Richards, and Bane Islands is not recommended as it has only been partially examined.

Estrella Bay, about $1\frac{1}{2}$ miles square and situated 15 miles south-eastward of Cape Megapode, is too open to afford good anchorage except in Kesuo Cove.

Kesuo Cove, situated in the northwestern corner of Estrella Bay and extending in a northwest by west direction for a distance of $1\frac{1}{2}$ miles, is 800 yards wide at the entrance between the reefs, gradually tapering toward its head. The shore on both sides is high and wooded, but it is low at its head.

Kesuo Cove has depths of 20 fathoms in the entrance, gradually decreasing in depth as the head of the cove is approached, from which the 5-fathom curve is distant about 200 yards.

Estrella Rock, 115 feet above high water, is a small bold islet with a wooded summit, situated on the reef off the northern entrance point to Kesuo Cove.

Observation spot (lat. $7^{\circ} 54' 59''$ S., long. $159^{\circ} 11' 14''$ E.).—The observation spot, on top of the ridge 396 feet above high water on the southern side of the cove, is reached by a path winding up the slope from the eastern end of the beach. It is marked by a \vee (broad arrow) cut in the stump of a fallen tree.

Anchorage.—There is good anchorage all over Kesuo Cove. The British naval vessel *Dart* anchored off the White Rock in a depth of 16 fathoms, over mud.

Tides.—It is high water, full and change, in Kesuo Cove at 3h. 20m.; springs rise $5\frac{1}{2}$ feet.

Hakelake Island, 70 feet high, is a small coral islet, covered with trees, situated 3 miles northeastward of Estrella Bay on the southern edge of a reef extending for $1\frac{1}{2}$ miles in a northeast by north and southwest by south direction.

Coast.—From Hakelake Island to Maringe Lagoon, a distance of $2\frac{1}{2}$ miles, a line of reefs and patches, with deep water between them, lie off the coast at distances of from 2 to 3 miles. There is navigable

water inside these reefs, but it must be used with the greatest caution, as it has not been examined.

Kakaebako Point is a remarkable bold point southeastward distant 6 miles from Hakelake Island. The bay to the southward of the point affords good anchorage in the southeast trade season in depths of from 10 to 12 fathoms.

Nuha Islet, about 160 feet above high water, is a bold islet, wooded on its summit, $1\frac{1}{2}$ miles to the eastward of Kakaebako Point, to which it is almost joined by rocks and shoal patches.

The bay to the southward of Nuha Islet appeared foul. It was not visited by the British naval vessel *Dart*.

Solanandiro Point, $1\frac{1}{2}$ miles southeastward of Nuha Islet, is a conspicuous point, surmounted by a rounded summit. From the point the land trends to the southeastward to Maringe Lagoon.

Kiaba Island, about 100 feet above high water, is a small islet lying on a coral reef in the line of reefs before mentioned, and situated about 1.3 miles from the mainland.

Kasakina Reef, nearly $1\frac{1}{2}$ miles in length, is situated $1\frac{1}{2}$ miles to the northwestward of Kiaba Island.

Masige Cay, about 3 feet high, is situated on a reef 4 miles to the southeastward of Kiaba Island and just to the westward of the chain of islands forming the Maringe Lagoon.

Maringe Lagoon, 6 miles in length in a northwest by west and southeast by east direction and from 1 to 2 miles in breadth, is formed between the mainland and a chain of five offlying islands. The entrance to the lagoon is between the two northern islands, Sule Island, about 275 feet, and Fara Island, about 210 feet, above high water. These islands are $2\frac{1}{4}$ miles apart, but the entrance to the lagoon is narrowed to a width of 1,600 yards between Mid Reef on the Sule Island side and the reef extending to the northwestward of Fara Island.

Fish Stakes Point (lat. $8^{\circ} 07' S.$, long. $159^{\circ} 34' E.$) is a sandy point and the southwest extreme of Fara Island.

Danger Shoal, a coral patch lying 650 yards to the westward of Fish Stakes Point, is, as a rule, difficult to make out.

Mount Sasari is a square conspicuous summit, 3,700 feet above high water, rising abruptly from the shore of Maringe Lagoon; and a remarkable waterfall, which falls into the lagoon near its southeastern corner, is named Boala by the natives, but it is not visible until nearly abreast of its position.

Boat passage.—There is a narrow boat passage between the islands of Karuo and Kumaigola, and thence to the southward, winding in a serpentine fashion through the reef and out to sea.

Anchorage.—Good anchorage, in from 15 to 20 fathoms water, may be obtained anywhere in the lagoon to the southward and south-eastward of Danger Shoal.

Tides.—It is high water, full and change, at Maringe Lagoon at 3h. (approximate); springs rise about 5 feet.

Coast.—The coast from the southern end of Maringe Lagoon trends in a south by east direction for a distance of 18 miles to Fulakora Point, and is fairly high. It is fringed in parts by a coral reef.

Tapula Island, a small wooded and bold island, about 100 feet above high water, lies close to the shore, 7 miles to the northwestward of Fulakora Point, and is a conspicuous object.

Berimasi is a peculiar stone on the reef to the northwestward of Tapula Island.

Villages.—Gau and Rogassi villages are situated on the high ground to the southward of Tapula Island.

Fulakora Point, the northern point of the eastern extreme of Ysabel Island, is a sandy point with the land rising up at the back in well-wooded slopes.

Shoal ground extends for a distance of nearly 2 miles to the eastward of Fulakora Point, with depths of from 2 to 5 fathoms over it.

Coast.—From Fulakora Point the coast trends in a southwest direction for 7 miles, to the head of Tunnibuli Bay, and then turns to the southeastward for 10 miles, to Cape Prieto, the southeastern extreme of Ysabel Island.

The coast line of this extensive bay, formed between Fulakora Point and Cape Prieto, is much indented and has numerous small islets and reefs scattered about it.

Tunnibuli Bay, formed between an unnamed island, 262 feet high, and the shore of the main island, northwestward of it, is situated $4\frac{1}{2}$ miles southwestward of Fulakora Point.

Village.—Tunnibuli village is small and situated on Draper Point, on the main island. Here there is a mission home belonging to the Melanesian mission, and there are also a few villages scattered about the shores of the bay.

Martin Point, a conspicuous bold point, is the eastern entrance point to Tunnibuli Bay. Moorman Point, about $1\frac{1}{4}$ miles southwestward, is a low mangrove point.

Pin Rocks are two remarkable pinnacle rocks, 30 feet above high water, situated about 100 yards eastward of Martin Point.

Anchorage.—Very good anchorage may be obtained, in a depth of 16 fathoms, over mud, in the center of a small cove formed by the reef, 550 yards in width, to the westward of Draper Point.

Mole Islet (lat. $8^{\circ} 24' 31''$ S., long. $159^{\circ} 47' 25''$ E.) is a small wooded, rocky islet, 65 feet above high water, in Tunnibuli Bay.

Tunnibuli Bay continues for $2\frac{1}{2}$ miles to the westward of Mole Islet, and another branch runs due south for nearly $2\frac{1}{2}$ miles. This part of the bay has general depths of from 12 to 20 fathoms to within $\frac{1}{4}$ mile of its head, but there are several shoal patches in it. The shore on both sides is chiefly mangrove and is fringed by coral reefs.

The bay eastward and southward of Mole Islet has not been properly examined and should therefore be used with caution.

Directions.—The entrance to Tunnibuli Bay is narrow, and, on approaching, it appears to be masked by the reef which extends northwestward of Martin Point.

Bring Mole Islet (65 feet) in line with the extreme of Draper Point bearing 246° , steer in on this line until the northwest summit of the Mahaga Range (1,188 feet) comes in line with Moorman Point 215° , and with this latter mark on round the reef to the southward of Draper Point at a convenient distance and anchor in the cove to the westward of the reef in 16 fathoms water.

The northwest summit of Mahaga Range has a conspicuous banyan tree growing in the dip just to the southeastward of the peak.

Tides.—It is high water, full and change, at Tunnibuli at 2h. 18m. (approximate); springs rise about $4\frac{1}{4}$ feet.

Coast.—**Kapika**, **Jagi**, **Siasigara**, and **Kolore** are a group of small islands lying between Martin Point and Boko Point, the latter a rounded point with a sandy beach. There are passages between them, but they have not been examined.

To the northward of Boko Point is a deep bight with good anchorage in a depth of 10 fathoms about $\frac{1}{2}$ mile inside the entrance. Lageba and Kerepei villages, on the shores of the bight, are small.

Nalignago is a small sand cay, 5 feet above high water, with a few stunted bushes, lying in the center of a coral reef nearly a mile in length and situated $5\frac{1}{2}$ miles southeastward of Fulakora Point.

Shoals.—Coral patches with depths of from 3 to 5 fathoms and possibly less water, extend for 1 mile to the west-southwestward of the cay, and the depths between Nalignago sand cay and the land are so very irregular that probably more shoals exist than are shown on the chart.

Tide rips.—Heavy overfalls occur from a line joining Jagi Island and Nalignago to Fulakora Point while the flood stream is running.

Mahige Island, about 300 feet high, $1\frac{1}{2}$ miles in length in a north-northwest and south-southeast direction and $\frac{3}{4}$ mile in breadth, lies with its southern end $2\frac{1}{2}$ miles northeastward from Cape Prieto and $1\frac{1}{4}$ miles from the land.

There is a good passage between Mahige Island and the mainland, with a navigable width of nearly a mile, the channel being narrowed by reefs and shoals on its western side.

Perforated Rocks.—Two conspicuous rocks 25 feet above high water, with a hole right through them, lie on the reef on the western side of the channel.

Shoal water extends $\frac{3}{4}$ mile north-northwestward of these rocks and for 1 mile south-southeast of them.

Tidal streams.—The tidal streams run strongly through this channel, attaining a velocity of from 3 to 4 knots, causing heavy overfalls.

The flood stream runs to the southeast by south and continues from $2\frac{1}{2}$ to 3 hours after high water by the shore.

Lumutu Island (lat. $8^{\circ} 31' S.$, long. $159^{\circ} 52' E.$) is a small island, 150 feet above high water, on the western extreme of a reef with a narrow boat passage between it and the land. It forms the northern side of Sigani anchorage.

Kilio and Sololo Islands, 192 and 200 feet above high water, respectively, are two islands on a reef projecting from the mainland. They form the southern side of Sigani anchorage.

Sigani anchorage is small and well protected and affords anchorage in from 17 to 18 fathoms water to the southward of Lumutu Island, but a vessel should anchor just inside a small coral patch with 7 fathoms water over it to avoid fouling her chain.

There are small villages on Lumutu Island and also on the mainland to the westward of the anchorage.

Shoals.—To the eastward of Mahige Island shoal water, with depths under 10 fathoms, extends for a distance of 2 miles and should be avoided. The soundings charted are very irregular and possibly dangers exist.

The 20-fathom curve is upward of $2\frac{1}{2}$ miles to the eastward of the island.

Coral banks to the eastward of Ysabel Island.—The *Dart* passed over several coral banks of various depths lying to the northward of Fulakora Point and running to the northwest by north till abreast of Māringe Lagoon, at a distance of from 6 to 8 miles from the land. The least depth found was from 4 to 5 fathoms, but very probably less water exists and a careful lookout is necessary when navigating in the locality.

These shoals are reported to extend as far to the eastward as Ramos Island.

Manning Strait is the passage separating Ysabel or Bugotu from the islands off the eastern end of Choiseul Island. In it the tidal races are so strong as to resemble breakers. The depth in the western passage between Haycock and the Arnavon Islands, judging by the appearance of the water which is clear, is probably not less than 7 fathoms, but several coral patches are reported in the approaches.

Arnavon Islands are uninhabited and densely wooded, the eastern being 80 feet high and the western 120 feet high to the tops of the trees. They abound with turtle.

Reefs extend from the eastern sides of each island, affording protected and good anchorages westward of them. Sicopo Harbor, on the western island, affords safe anchorage at all times in a depth of 14 fathoms.

Cape Labee (lat. $7^{\circ} 30' S.$, long. $157^{\circ} 53' E.$) is the eastern extreme of Haycock Island in this archipelago, and may probably be recognized from a distance of 12 miles by a round haycock-shaped hill about 250 feet above high water on its western side. It is, however, but little higher than the neighboring trees. This island has a lagoon in it which occupies the greater part. There are three remarkable thumb-shaped rocks to the northward of this haycock, about 80 feet above high water, rising nearly perpendicularly from the water.

The British naval vessel *Danae* rounded Cape Labee at a distance of $1\frac{1}{2}$ miles, in depths of from 9 to 15 fathoms, and passed between the two shoals below mentioned, with Cape Labee bearing about 337° .

Islands.—The islands on the western side of Manning Strait are owned by the Solomon Islands Development Co., who are clearing them of wood and planting coconut palms. The principal stations of the company are on Salikanna Island and on the northeastern side of Waginna Island. The only inhabitants of the group are the imported laborers.

These islands are generally low, and all are densely wooded, being mostly connected with each other by reefs. Waginna, Rob Roy, and Dillimore are the largest islands, and are each about 200 feet high.

Hamilton Channel.—This passage, westward of Waginna Island, is the principal channel through the group. It is reported to be deep and clear of dangers, but difficult of navigation for large vessels.

Channels.—The channel between Dillimore and Rob Roy Islands is narrow but deep, the tidal stream in the northern part attaining a velocity of 8 knots.

The passage between Rob Roy Island and Choiseul is obstructed by rocks.

Tides.—In Hamilton Channel the rise of tide is 5 feet; the tidal streams attain a velocity of 5 knots.

Anchorage.—Large vessels can anchor in Hamilton Channel, and there are several anchorages in the group for vessels of less than 10 feet draft.

Shoals.—The south side of the group is fronted by a line of shoals which sometimes break, extending from South Island, which is 60 feet high, to Palm Island, 80 feet high.

Foul ground is situated between 7 and 9 miles east-southeastward of Palm Island.

Extensive shoals are also reported to be situated about 7 miles northward of the group, and foul ground, which breaks, at 20 miles northward of Arnavon Islands. The latter is not shown on the chart.

Directions.—Vessels approaching from the southward usually make Palm Island, and proceed through the channel westward of that island.

Shoals.—In Manning Strait a shoal exists with a depth of about 5 fathoms over it, its eastern edge being about 162° distant $6\frac{1}{2}$ miles from Cape Labee. The western extreme of another shoal lies 151° 7 miles from Cape Lebee, having over it about 9 fathoms. There is probably shoaler water. Shoal water and many coral patches are reported on the northern side of the strait.

Choiseul Island, where the British flag was hoisted and a protectorate declared on August 23, 1900, lies to the westward of Ysabel Island, and is about 80 miles in length and from 10 to 15 miles in breadth. It rises to an elevation of about 2,000 feet above high water, and from the westward has the appearance of a level-topped ridge destitute of peaks. Like all the other islands of this group, it is thickly wooded.

The northeastern side of the island is mountainous, rugged, and steep; but near Cape Alexander, the northern extreme, the low land fronting the hills is of considerable extent. The eastern end is low, but marked by Taura Peak, 1,800 feet above high water, while the southwestern side rises to irregular ranges of considerable height, and is for the most part fronted by chains of reefs extending from 3 to 5 miles from the shore.

The island has not been surveyed and great caution is necessary when in the vicinity.

First Cape is the southeastern extreme of Choiseul Island, and off that end of the island is an archipelago of low wooded islands, extending 20 miles in an easterly direction, and forming the western side of Manning Strait, before described. A reef is charted as extending 5 miles northeastward of First Cape. It is probably a portion of the barrier reef of the island.

Anchorage.—There is fairly sheltered anchorage, in a depth of 18 fathoms, over mud, during the southeast season, and well sheltered in the opposite season, within the southernmost of the small islands situated between the cape and Lina Island, and about $\frac{1}{2}$ mile off-shore. There are several reefs in the approach which should be sighted from aloft.

Bambatani (lat. $7^{\circ} 05' S.$, long. $156^{\circ} 45' E.$).—The neighborhood of that part of the island known as Bambatani, and which has eight villages, may be recognized from seaward by a very conspicuous break in the foothills, forming a wide valley, densely wooded, with

one or two rivers running through it. At either end of the valley the land rises abruptly. On the northwestern side there is a cliff facing seaward with a village on it. The coast villages are not seen from seaward, being entirely screened by the dense forest growth.

Reefs.—As many as 15 coral patches, some of which were awash, were counted from the British naval vessel *Emerald*, at a distance of from 3 to 6 miles southward of the south coast of Choiseul Island, from abreast Bambatani eastward. One of considerable extent was said to lie 10 miles southward of Bambatani, but according to native pilots it has no existence.

A passage, apparently clear, exists 2 to 3 miles from the southern coast of Choiseul Island from longitude 157° E. westward as far as Bambatani. One shoal spot was seen in this passage, which can be passed on either hand. The *Emerald* went between it and the island.

Anchorage.—From a position about 16 miles 162° from the eastern end of Bambatani Bay the German corvette *Adler* reached the anchorage off the villages by passing through an extensive chain of reefs, situated at a distance of 3 to 6 miles from the coast, being assisted by a native of Mono Island who had frequently acted as a pilot for English naval vessels in these waters. There is anchorage also at 3 miles westward of the villages, at 1 mile offshore, in a depth of about 17 fathoms, over mud. Reefs fringe the coast to the distance of from 200 to 400 yards, with small openings, affording landing in places. The coast line is hilly and densely wooded, and numbers of natives are met with.

Coast.—From Bambatani the coast trends northwestward for about 30 miles to Choiseul Bay, of which coast but little is known.

Choiseul Bay (lat. $6^{\circ} 43'$ S., long. $156^{\circ} 25'$ E.) is situated on the western side of the northern end of Choiseul Island, on the eastern side of Bougainville Strait, and is formed by a broken barrier reef, on the inner edge of which are situated five islands. There are three entrances to the bay, the best of which, Emerald entrance, is situated southward of Passage Island, the second island from the northward.

In the middle of the southern entrance there is a patch with 3 fathoms water over it.

The coast southward of Choiseul Bay is slightly indented, the hills at the back rising to a height of 1,550 feet above high water, being steep and densely wooded. At the distance of $6\frac{1}{2}$ miles southeastward of the southern entrance is a conspicuous white cliff.

Two considerable streams flow into Choiseul Bay and another, named the Warrior River, is near the southern entrance.

Mulamabuli River, near Guppy Island, is navigable for boats for about 2 miles, the depths being from 8 to 14 feet, with about 20 feet in places. At the above distance from its mouth there are rapids,

and two tributaries join it. The northern stream is only navigable by boats for a short distance.

Anchorage may be obtained anywhere in the bay. The best is in a depth of 15 fathoms, over sand, to the northward of Guppy Island, a small wooded island in the center of the bay.

Directions.—In entering by Emerald entrance to the western channel the northern side should be kept, as patches lie beyond the edge of the reef on the southern side.

In entering by the southern channel pass about $\frac{1}{2}$ mile southward of Redman Island, thence on either side of the middle patch, and westward of Guppy Island.

Tidal streams.—Immediately southward of the entrance to Choiseul Bay the tidal streams run from 2 to 3 knots at springs, the flood to the southeastward, the ebb to the northwestward. The streams are also felt in the bay.

Cape Alexander (lat. $6^{\circ} 35' S.$, long. $156^{\circ} 28' E.$).—From Choiseul Bay the coast trends northward for 2 miles, and then northeastward 5 miles to Cape Alexander, where the land is low and undulating and fronted by a fringing reef varying in width from $\frac{3}{4}$ mile off West Cape to $\frac{1}{4}$ mile off Cape Alexander.

About 2 miles eastward of the cape is a rounded point, with a bay between. Off the point is an islet, connected with it by a reef; and beyond it, at about $\frac{1}{2}$ mile offshore, is the western extreme of the barrier reef which extends parallel with the shore for about 4 miles to abreast Kumbakale, where there is an opening. From thence it continues to Tomba Tomba Islet, distant $1\frac{1}{2}$ miles; $1\frac{1}{2}$ miles farther is Kangopassa Islet. Kangopassa village is where the massacre of the crew of the *Zephyr* took place in 1880.

Anchorage.—The opening in the reef mentioned above is 300 yards wide, with a depth of 30 fathoms, both sides being marked by breakers.

The Austrian naval vessel *Fasana* entered by this opening and anchored 1 mile southward of it in a depth of 23 fathoms, over mud.

A coral bank with 7 fathoms water over it was found 600 yards northwestward of the anchorage taken. There was a small waterfall in the cove abreast.

The north coast of Choiseul must be navigated with extreme caution. Cape Giraud is charted about midway.

The northeastern side of this island is fronted by a barrier reef, which frequently breaks, extending almost continuously at a distance of from 5 to 6 miles from the shore between Taura Bay and Cape Giraud, and then approaching to a distance of 3 miles off Tomba Tomba. The eastern portion of the passage inside this reef is reported to be clear of dangers, but several shoal patches obstruct the western portion.

Nanango is a village situated about 14 miles westward of the small island off Cape Giraud, and Tomba Tomba is a mission station.

Shoal.—A detached shoal, which breaks, reported in 1908, is situated about 27 miles eastward of Cape Giraud.

Bougainville Strait—Southern approach.—Mono (Treasury) Island, the southwesternmost island in the southern approach to Bougainville Strait, is the westernmost island under the British protectorate.

It is of coral formation, oval shaped, extending $6\frac{1}{2}$ miles in an east-and-west direction by 4 miles north and south, and densely wooded, rising by gradual slopes to a height of 1,165 feet above high water.

The northern and western sides are bold and steep-to. On the northeast side there is a sandy bay, where anchorage might be obtained, in a depth of 20 fathoms, during the northwest season. The southeast coast, from Toaloko Point, consists of cliffs from 30 to 60 feet above high water.

Population.—The population of Mono Island is estimated at under 500. Some speak Fijian and a few understand a little English. Many of the men leave in labor vessels. These natives formerly had a bad reputation, and are known to have committed several murders. At the time of the *Lark's* visit in 1883, however, they were perfectly friendly and willing to engage as pilots and interpreters.

Stirling Island, lying close southward of Mono Island, is a raised coral island, about 200 feet in height, 3 miles in length, with an average breadth of $\frac{1}{2}$ mile. In its eastern part there is a fresh-water lake about 200 yards across and 3 fathoms deep.

Watson and Wilson Islands lie to the northward of Stirling Island and these, together with the southern side of Mono Island, form Blanche Harbor.

Blanche Harbor lies between Mono and Stirling Islands. Its eastern entrance is 800 yards broad with deep water.

Daly Rock lies in the eastern entrance, 300 yards west-northwestward of Wilson Point. It may be passed on either side.

Heming Rock, having a depth of $1\frac{1}{4}$ fathoms on it at low-water ordinary springs, lies in the passage between Watson Island and Mono Island, with the mouth of the stream at Saveke bearing 305° and the eastern extreme of Watson Island 165° .

Supplies.—The natives are friendly and willing to trade, and the usual native supplies are obtainable. Excellent water can be procured from the stream to the westward of Saveke. Falamai village lies at the head of the bay.

Stirling and Wilson Islands are being cleared of wood and planted with coconut palms.

Position (lat. $7^{\circ} 24' 30''$ S., long. $155^{\circ} 34' 00''$ E.).—The position given is that of Observation Islet, southward of Watson Island.

Anchorage.—The best anchorage, in the southeast season, is in 10 fathoms water, over sand, and immediately westward of a line joining the western extreme of Watson Island and the mouth of a stream to the northward of it. There is also good anchorage for small craft anywhere eastward of the above-mentioned line and northward of Watson Island.

During the northwest monsoon the swell is reported to set in on the western side of Watson Island, and as heavy gales are sometimes experienced from the westward, the best anchorage at this season would be on the eastern side of Watson Island or in the bay southward of Wilson Island.

Directions.—The northern extreme of Wilson Island in line with the southern side of Watson Island, bearing 252° , leads in through the eastern entrance northward of Daly Rock. After passing this danger a vessel will be in soundings with the hand lead, and may obtain anchorage as above.

If passing eastward of Watson Island a lookout must be kept for Heming Rock.

Entering from the westward there are no known dangers.

Tides.—In Blanche Harbor, the channel between Mono and Stirling Islands, the flood stream sets to the westward and the ebb to the eastward.

During the month of June it was found to be high water, full and change, at 2.24 a. m. High water at neaps occurred at 4 a. m.

During the whole month the time of high water ranged between 12.45 and 4 a. m. The greatest rise of tide was 3 feet 3 inches.

The tides during the middle part of September, 1883, were found to reach a maximum height between 4 and 8 p. m., and after falling very slightly, to reach a second maximum between 12.30 and 6 a. m., after which they fell to low water between 9 and 11 a. m. Rise of tide 2 feet.

Bougainville Strait—Directions.—Bougainville Strait, separating Bougainville Island from Choiseul Island, is about 26 miles wide and obstructed by numerous islands. The principal channel lies between Choiseul Island on the east and Cyprian Bridge and the Oema Islands on the west, and is about 15 miles wide.

The strait has a bar, about 6 miles across, within the 100-fathom curve, with general depths in the fairway of from 14 to 60 fathoms over a breadth of 3 to 4 miles, on either side of which are banks of 6 to 10 fathoms, and others, nearer the shores, with as little as 4 fathoms. Apparently there are no dangers in or near the actual fairway, and there should be no difficulty in maintaining that track. The course through is about 345° and 165° .

Bougainville Strait is the route recommended for vessels proceeding from the east coast of Australia to Japan, and for full-powered vessels in both directions.

Tides.—In Bougainville Strait the change of stream from south to north occurs on full and change days at 7.20 p. m. Slack water on any other day may be approximately calculated by applying the usual daily differences to this time.

Tidal streams.—Over the shoal water the tidal streams run from 2 to 3 knots at springs. At times the current overcomes the tidal stream. In May a constant set to the southwestward has been observed.

Tide rips extend across the strait, and during strong winds there are overfalls on the shoal patches and on the 100-fathom edge of soundings.

Abnormal variation of the compass has been reported off the southeast end of Bougainville Island.

Western shore.—The western shore of the strait is formed by the southeast extreme of Bougainville Island from Komaleai Point to Cape Friendship. The eastern shore is described with Choiseul Island and Bay.

Komaleai Point (lat. $6^{\circ} 53' S.$, long. $155^{\circ} 42' E.$) is the southwestern extreme of the strait. To the westward the coast is low and skirted, at a distance of about 10 miles, by a broken barrier reef with islets in places, a mile outside of which there is no bottom at 100 fathoms. Within this reef there is an average depth of about 24 fathoms.

From Komaleai Point the coast trends in a northeast by east direction to Tonolai Harbor.

The coast between Komaleai Point and Cape Friendship is generally low and fringed with a white sandy beach. It is thickly wooded a few miles back and slopes gradually to the high mountains in the center of the island, these slopes being also thickly wooded.

Tonolai Harbor (lat. $6^{\circ} 43' S.$, long. $155^{\circ} 55' E.$) is a fine anchorage, $4\frac{1}{2}$ miles in length, with an average breadth of $\frac{3}{4}$ mile, and open to the southward. It is almost surrounded by high hills, and lies southwestward of Cape Friendship and westward of Ovau Island.

At the entrance is a patch of coral with a sand cay 2 feet above high water, which can be passed on either side.

Anchorage may be obtained anywhere, with good shelter from the prevailing winds, in depths of from 14 to 20 fathoms, over sand and mud.

No natives were met with during the examination of this harbor, but numerous fires were observed in the vicinity.

Cape Friendship, northeastward of Tonolai Harbor, is marked by a conspicuous red cliff.

At $1\frac{1}{2}$ miles northward of Cape Friendship is Refuge Island, small and 250 feet above high water, and from hence to the northward the coast is low and sandy. The country immediately behind is flat.

Islands in the strait.—Shortland Island, lying 15 miles northeast by east of Mono Island, is 11 miles in length in an east-by-west direction, with an average breadth of 7 miles, and rises to a height of 676 feet, but without any conspicuous peaks. It is densely wooded.

The British flag was hoisted and a protectorate declared on August 22, 1900.

Off the southern side is Morgusaia Island, separated from the larger island by a narrow channel navigable for boats. Westward of its southern point the coast is fringed by a reef, and the 100-fathom curve skirts the shore at about the distance of a mile.

Gomai Point is the western extreme of an island, $1\frac{1}{2}$ miles in length, situated on the reef fringing the southwest extremity of Shortland Island. Three islets about 80 feet above high water mark the southwest edge of the reef.

Anchorage.—Westward of Shortland Island and northward of Gomai Point there are numerous islands and patches of reef among which anchorage may be obtained. The best is southward of Lau-mono Island and northeastward of Gomai Point in 10 fathoms water, over sand and coral.

Vessels approaching this anchorage from the southward should pass between Gomai Point and Taukuna, the next island to the westward, looking out for a 3-fathom patch just inside the entrance.

Shortland Harbor.—Alu Island is a wooded coral island, 150 feet above high water, close eastward of Poporang Island, adjoining the eastern coast of Shortland Island. It is cultivated and, except on the northwestern side, is fringed by reefs.

A house with flagstaff is situated near the south point of Faisi Island, from which a pier extends. The residency, known as Bam-bagiai, is situated on a hill on Shortland Island, about $\frac{1}{2}$ mile southwestward of Faisi Island.

A pier extends from Shortland Island southward of Faisi Island.

Orlofe Island is cleared of wood and planted with coconut palms. A trader's house is situated on the western side.

Faisi Island is completely planted with coconut palms and has houses and stores on its southeastern side.

Several houses and a church are situated on the northeastern side of Poporang. The channel between Poporang and Shortland Island is only available for boats.

Supplies.—Stores of all descriptions can be obtained.

Shoal.—A shoal of $3\frac{1}{2}$ fathoms is situated with the eastern extreme of Faisi Island bearing 19° , distant about 1,200 yards.

Two 4-fathom rocks are situated close to this shoal, and 5 fathoms is the general depth around.

Tides.—The tidal streams run strongly through the channels among these islands.

Current.—Between Shortland Island and Narovo a current is occasionally experienced setting southward with a velocity of $1\frac{1}{2}$ knots.

Port of entry.—Shortland Harbor is a port of entry for the Solomon Islands.

Anchorage.—To the northward of Aluare two small coral islands, the eastern of which, named Onua, is situated on the northwestern side of a coral reef nearly 1 mile in diameter. Orlofe, the western islet, affords protection during the southeast trade, the anchorage being in a depth of 11 fathoms, over sand, 500 yards from its northwest end, with the half of Onua Island open northward of it, bearing about 103° . The southern passage to this anchorage is marked by a bushy islet named Battery, situated on the northern end of Alu Reef.

The least water in this channel will be found on a spit, with 4 fathoms water over it, extending 176° from Orlofe.

Small vessels of less than 12 feet draft can anchor off Alu village, between Alu and Poporang, entering northward of Battery Islet.

There are three villages on Alu Island and others on Poporang. In 1886 the chief of these was dominant over all the islands of Bougainville Strait, as well as the adjacent coasts of Bougainville and Choiseul. The natives were friendly, and all armed with rifles.

Mission.—A Roman Catholic mission has been established on Poporang, the mission house being on top of a hill at the northern end of the island, where the ground has been cleared and planted. An English trader lives on Faisi Island, northward of Poporang, and exports copra.

Water.—There is reported to be a stream of good water, which falls down a steep slope, at the northern end of Poporang Island and is easy of access by boats.

Islands.—Northeastward of Alu is the high, conspicuous island of Fauro, and between the latter and the main island of Bougainville there is an archipelago of small islands, the highest of which, Illina, rises to a sharp peak, 616 feet above high water.

Between Illina and Fauro the depths are from 35 to 45 fathoms, gradually decreasing toward the coast of Bougainville Island.

Ballale Island.—The shoals of 4 and 5 fathoms situated on the southeast edge of the bank southeastward of this island frequently break with a swell from the southeastward. This island is being cleared of wood.

Fauro is a volcanic island extending 11 miles in a north-and-south direction and varying in width from $\frac{1}{2}$ to 3 miles. It is densely wooded, indented with many bays, and to the southeastward is protected by a broken barrier reef, within which are several anchorages.

The summit of the island is precipitous, and rises to a height of 1,925 feet above high water. There is a conspicuous sharp peak 1 mile southward of it.

Anchorage.—Good but deep anchorage, in a depth of 26 fathoms, is found at from 200 to 400 yards eastward of Awa Island, situated off the southwest coast of Fauro, avoiding a rock of 6 feet, situated 300 yards eastward of Awa.

A conspicuous house and small jetty are situated on the south end of Awa Island.

The anchorage is usually entered through the channel between Nufanaha and Awa Islands.

Toma Harbor (lat. $6^{\circ} 59' S.$, long. $156^{\circ} 05' E.$), on the southern side of Fauro Island, is protected by the barrier reef and affords good anchorage. The entrance recommended is from the northeastward. Vessels should steer 277° , toward the center of Entrance Bay, until the spit extending northward from the barrier reef is made out; and having passed it at distances of from 200 to 400 yards, steer to the southward, keeping midway between the reef and island.

There is a small village on Toma Point. No good water is obtainable.

There are other entrances through the reefs, but they are narrow and have numerous shoal patches in them, and should only be attempted with a commanding breeze and the sun in a favorable position.

Anchorage may be obtained anywhere in depths of from 17 to 20 fathoms, over mud and clay, after having passed Toma Point.

Munia Island, situated on a coral reef to the southwestward of Fauro, is a conspicuous, wooded island, $\frac{3}{4}$ mile in diameter and 275 feet above high water. Sunken patches extend southward of it for a distance of 2 miles.

Rofei Island, between Munia and Toma, is 123 feet above high water.

Around Munia and Rofei are many islets. The southeasternmost and largest of these has a few coconut trees on its eastern edge. They are all surrounded by fringing reefs and are not very conspicuous from seaward.

Sinasora Bay, on the southeastern side of Fauro, affords snug anchorage in from 18 to 23 fathoms water.

At $1\frac{1}{2}$ miles southeastward of the entrance is a patch with 3 fathoms water over it, which may be avoided when coming from the eastward

by approaching East Cape to within 400 yards, then steering along shore southward of Flat Rock.

If approaching from the southward keep East Hill bearing 13° until close to Flat Rock, when alter course to the westward for the entrance.

A conspicuous house is situated on the south entrance point of this bay.

Tides.—Strong tidal streams, with tide rips and eddies, are frequently experienced westward of Fauro and between that island and Shortland Island.

Water.—There is a village on the western side of the bay, and good water may be obtained at the head.

East Cape (lat. $6^{\circ} 56' S.$, long. $156^{\circ} 09' E.$), the eastern point of Fauro Island, is the extremity of a narrow peninsula, bold on the northern side. Between a distance of 1 and 4 miles eastward of East Cape there are patches which have not yet been examined.

Piedu and Masamasa Islands.—Northward of East Cape is a group of eight islands, the two largest, named Piedu and Masamasa, are respectively 540 and 575 feet above high water.

Cyprian Bridge Island, one of the group mentioned, is 375 feet above high water, dome shaped, and is the easternmost island on the western side of Bougainville main channel.

Kanasata Island, 140 feet above high water, with a ledge extending eastward of it, lies about 1 mile off the northern extreme of Fauro Island.

Ovau Island, lying between the northwest part of Fauro and Bougainville Island, is 1,340 feet above high water, and has a clear channel on either side, but they are not recommended to a sailing vessel, as the wind is baffling and the tidal streams run with a velocity of from 2 to 3 knots.

Oema or Uma Island, lying 6 miles northeastward of Ovau Island, is 802 feet above high water.

Two miles northward of it lies Oema Atoll, on which there are several islets the two highest being 236 and 217 feet above high water. Between the two westernmost of these islets there is an opening in the reef where a small vessel could obtain anchorage in depths from 16 to 20 fathoms. The entrance is 200 yards in width with a depth of 7 fathoms.

Northeastward of Oema Atoll are patches with depths of from $3\frac{1}{2}$ to 7 fathoms over them. The 100-fathom curve skirts the atoll at a distance of from 1 to $1\frac{1}{2}$ miles.

Northwestward of Oema the chart shows islands and reefs to a distance of 10 miles off Bougainville Island, but that portion has not been surveyed.

The eastern side of the strait, Choiseul Bay, etc., has been described on prior page.

Bougainville Island, the largest of the Colomon Islands, is separated from Ysabel Island by Bougainville Strait. It is about 110 miles in length in a northwest and southeast direction and from 20 to 35 miles in breadth. The southern part of this island is high, the peaks ranging between 4,000 and 10,000 feet above high water.

Among these are several volcanic cones, but only one, Bagana, in the center of the island, is at present in a state of active eruption. This volcano forms a conspicuous object, being visible for more than 50 miles in clear weather. The summit of the island is Mount Balbi, 10,171 feet above high water, on the Emperor Range, in the northern half of the island.

Owing to the ferocity of its inhabitants, Bougainville is less known than any of the larger islands of the group, and no white man is (1887) believed to have penetrated its interior.

At all the places around the island visited by the British naval vessel *Torch* (1903), with the exception of Gazelle Harbor, the natives came off in canoes, and, although at first slightly suspicious, became anxious to trade when they understood it was a naval vessel. Nearly all of them spoke pidgin English and many appeared to have worked for Englishmen in Samoa.

The coast appears to be much varied, covered with thick forest, and backed by mountain ranges.

Caution.—The island must be approached with caution, as, with the exception of its eastern extreme, it has not been surveyed.

This eastern extreme, which forms the western side of Bougainville Strait, is described elsewhere.

Abnormal variation of the compass has been reported off the southeast end of the island.

Protectorate.—Bougainville and Buka Islands and the small adjacent islands are under the protection of Germany.

Northeast coast.—From Cape Friendship, the southeast extreme of the island, the coast trends northwestward, and is but little known. The chart shows a barrier reef with islets on it extending some 10 miles off. The principal islands are named Stalia, Zeune, Griesbach Martins, and Dieterici.

Toiemonapu Bay.—A reef with $1\frac{1}{2}$ fathoms of water on it lies in Toiemonapu Bay.

Anchorage (lat. $6^{\circ} 10' S.$, long. $155^{\circ} 36' E.$) may be found in Toboroi Bay, southward of the Martins Islands. There is a thickly populated village here, and the largest island is named Kokoko.

The German naval vessel *Condor* (1906) anchored in 17 fathoms water in the bay southward of Kieta, with the eastern side of Kokoko bearing 100° .

The inhabitants of this part of the coast have large canoes and are apparently fearless and friendly, but note remarks above.

The British naval vessel *Torch* (1903) passed through a deep and clear passage between Martins Islands and the main island and anchored in 17 fathoms water between the largest of the Martins Islands and the main island. Mid-channel should be kept in the passage and a good lookout for shoals. This vessel also proceeded down the coast inside the barrier reef and passed out between a small island off Cape Friendship and the main island, experiencing a strong northwesterly set along the east coast.

A deep bay indents the coast westward of Martins Islands and apparently affords anchorage, there being a depth of 17 fathoms at the entrance; some shoals were observed in the southern part of this bay, and the end of the barrier reef appears to bear about 7° from Martins Islands.

Kieta.—Kieta is the only port of entry for those of the Solomon Islands in German territory.

A magistrate is in residence and provisions can be obtained.

Communication by a motor pinnace is maintained with Shortland Island.

There are two piers about 200 yards apart. On the southwestern pier is a water pipe, which is fed from a tank holding 50 tons of water.

In the harbor there is a mooring buoy for small vessels.

Beacons.—An iron beacon, 48 feet high, has been erected on the western edge of Wagoromodo Reef in the approach of Kieta.

A three-sided iron pyramidal beacon, with cross and ring as top marks, has been erected on the 6-foot shoal in the south entrance to Kieta.

A red buoy marks the 17-foot shoal in latitude 6° 12' 44" S., longitude 155° 40' 57" E. in approach to Kieta.

Light.—A fixed red lantern light is shown from the head of the small landing pier at Kieta.

Reef.—A reef with about 1½ fathoms over it lies in the vicinity of the anchorage northward of Schwarze huk, latitude 6° 03' S.

Mission.—A mission station is established at Kieta, which is situated on the mainland abreast the southern part of the Martins Islands. There are some white houses at Kieta which may be seen from seaward, the approach being through the reef fronting Martins Islands, after which there is a good channel to the anchorage. Several of the shoals in this locality appear to be beaconed.

Numa Numa (lat. 5° 55' S., long. 155° 09' E.) is a village situated about 32 miles northwestward of Toboroi Bay, and here the barrier reef appears to extend about 6 miles from the coast. If bound to

Numa Numa, Mount Balbi kept on a 243° bearing leads in clear of the reefs, and a vessel can then coast along to the southward until abreast the village, but these directions must be received with caution and the vessel navigated from aloft with the sun in a favorable position.

Anchorage was obtained by the British naval vessel *Emerald* (1881) near Numa Numa in a small bay to the northward of the huts of the village. The beach of this bay is steep and has no fringing reef.

Cape Laverdie.—Northward of Numa Numa the barrier reef continues to within a short distance of Cape Laverdie at a distance of from $\frac{1}{2}$ to 3 miles from the coast. Through it there are several passages. From the cape the coast trends westward to King Albert Strait.

Ernest Gunther Harbor, immediately southward of Cape Laverdie, is a large bay fronted by several islands connected by a reef, and affords sheltered anchorage. The British naval vessel *Torch* (1903) anchored here in a depth of 17 fathoms fairly close to the shore.

A white tripod pyramidal iron beacon about 11 feet high, with triangle apex upward as topmark, is erected on the southwest corner of the reef on the west side of Keop (Teop) Island.

Directions.—A reef extends a considerable distance to the southward of the island, which lies immediately eastward of Cape Laverdie, and the passage to the anchorage is between its extreme and a reef which extends off the main island. It is stated that two peaks (which are not so high as peaks to the westward) bearing 221° lead through the passage, which is about $\frac{1}{2}$ mile in breadth, and both reefs are easily seen.

Northern coast.—From Cape Laverdie the northern coast, composed of white chalky cliffs and thickly wooded, has a westerly direction for about 15 miles to King Albert Strait, and in this stretch there are stated to be good harbors.

Timpuz is a good deep bay with room for three or four vessels.

Beacon.—An iron beacon, with diamond topmark, is erected on the edge of the reef in Timpuz Harbor.

Laua Harbor, eastward of Banin Mount, consists of a narrow passage with a bay within, affording room for about two vessels.

Banin Harbor, a deep bay with room for about two vessels, lies westward of Banin Mount. The depth for anchorage in these three latter places is probably about 20 fathoms, there being not less than 18 fathoms very close to the shore.

Southwest coast.—The south coast has been already described with Bougainville Strait. From Komaleai Point the southwestern

coast of Bougainville Island trends northwestward to Empress Augusta Bay, fronted by islets and reefs, the latter extending to the distance of about 20 miles in places.

Caution.—It is probable that more foul ground exists off the western coast of Bougainville Island than is charted. Great care is therefore necessary in navigating in this vicinity.

Empress Augusta Bay, on the western side of Bougainville Island, was examined by the German vessel *Gazelle* in 1875.

The bay is of considerable extent, with depths of 30 fathoms at $\frac{1}{2}$ mile from the shore, decreasing to 4 fathoms at 200 yards from the beach. Its shores are fringed with mangrove, decreasing in breadth as the northern part of the bay is approached. Imposing mountains form the background, among which, to the northward, is Bagana Volcano.

Dangers.—At about $6\frac{1}{2}$ miles 283° of Husker Point, the southwest extremity of Empress Augusta Bay, are two detached patches having a depth of about $2\frac{1}{2}$ fathoms over them. Patches are reported about 13 miles 238° of the point.

At a distance of about from 12 to 18 miles 201° of the same point are four detached coral patches, having upon them depths of about 3 fathoms, with deep water around, and at about 7 miles southward of these patches, or 182° , distant about 20 miles from Husker Point, is a coral reef nearly awash and about 3 miles in extent.

Gazelle Harbor (lat. $6^{\circ} 35' S.$, long. $155^{\circ} 05' E.$) is the bight in the southern part of Empress Augusta Bay, within Husker Point and between it and a reef which extends about $\frac{3}{4}$ mile from the shore of the main island in a northwesterly direction. The southern shore of the harbor is fringed by a reef which is steep-to, extends about $\frac{1}{2}$ mile from it, and has from 4 to 10 feet water over it.

Water.—Fresh water was obtained from a small river about 2 miles northward of Gazelle Harbor close northward of where the shore reef extends nearly $\frac{3}{4}$ mile off.

Anchorage may be obtained in Gazelle Harbor, in about 15 fathoms water, near the steep edge of the reef already mentioned, but as the water is deep outside and shoals rapidly inshore it is not a good anchorage, and several alterations having taken place in the contour of and in the depths in this harbor, it should be approached with caution.

Pigeon Islands, situated about 10 miles northward of Husker Point, have reefs extending about $\frac{1}{4}$ mile from their seaward sides, but the British naval vessel *Torch* (1903) found anchorage, in about 15 fathoms water, between them and the main island. A careful lookout for shoals should be kept in this vicinity.

Three shoals are situated about 3 miles 266° of the islands, and two between the islands and the mainland. These latter shoals are easily seen from the masthead.

There is also probably anchorage in a deep bay to the southward of Miller Islands.

Cape Moltke, about 14 miles northwestward of the Pigeon Islands, has an islet charted off it. Near the cape the British naval vessel *Torch* passed over a patch on which a depth of 5 fathoms was obtained, and obtained anchorage, in a depth of 8 fathoms, off Belua Village, about 11 miles farther northward, and there appeared to be anchorage all along the coast.

Natives.—No natives were seen near the harbor, but in the vicinity of a river about 9 miles to the northward the boats of the *Gazelle* (1875) fell in with a large war canoe containing several. The men seen were naked and their arms consisted of poisoned spears and bows and arrows.

Tides.—It is high water, full and change, in Gazelle Harbor at about 12h. Rise and fall of tide, 3 to 4 feet. The flood runs about 9h. and the ebb about 15h.

Coast.—From Empress Augusta Bay the coast continues northwestward to the north extreme of the island, backed by the Emperor Range, the summit of which is Mount Balbi, 10,171 feet above high water.

Dangers.—A sand bank about $\frac{1}{4}$ mile in extent, with a tree growing on its southeast end, whence also a reef extended, was observed by the British naval vessel *Beagle* about 14 miles westward of Cape Moltke, and patches are charted about 4 miles southeastward of it.

Northward of Belua the British naval vessel *Torch* passed several of the shoals and islets which are shown on the chart.

Natives.—The natives on the west coast appeared to be suspicious, as only one came off to the British naval vessel *Torch*.

Buka Island (lat. $5^{\circ} 16' S.$, long. $154^{\circ} 33' E.$) is separated from the northern extreme of Bougainville Island by King Albert Strait. It is about 30 miles in length in a north-and-south direction by about 8 miles in breadth, with its summit near the center of its western side 1,306 feet above high water. The island appears to be more fertile than Bougainville and thickly inhabited. The natives are reported to be of finer physique than those of the other islands, and have been known to attack vessels. At the visit of the *Torch* (1903) they were all armed with bows, arrows, and spears, which, however, they were anxious to trade.

Barrier reef.—The western side of the island has a barrier reef with islands on it at from 2 to 3 miles offshore, and its outer edge appears to be well defined and free from danger. Sale and Mat-

zungan, the southern islands on the barrier, are joined by the reef, with a passage about 200 yards in width between the latter and Petat, the next island to the northward. Petat and Yame Islands are apparently joined, and there is a passage with a depth of 10 fathoms in it northward of Yame Island, which is 700 yards wide and leads to a roomy anchorage off the northeast end of Petat Island, in about 13 fathoms of water, with good shelter and space to admit 10 large vessels.

The British naval vessel *Torch* (1903) used an opening to the southward of Petat Island, which appeared to be quite clear, with a depth of 10 fathoms in it. The highest peak on the island over four islets off the shore bearing about 97° or 94° was found to lead through this passage, and anchorage was obtained between Petat and Matzungan Islands about $\frac{3}{4}$ mile from the shore. There is a large village on Matzungan Island, and the natives visited the British naval vessel *Torch* in great numbers.

In November, 1888, the German naval vessels *Ysabel* and *Samoa* passed from Queen Carola Harbor southward within the barrier reef, and at 14 miles from the harbor they arrived off the entrance to a large lagoon abreast of two small islands.

Cape North, the northern extreme of Buka Island, is stated to be of moderate elevation, with numerous low islets off it.

Queen Carola Harbor (lat. $5^{\circ} 10' S.$, long. $154^{\circ} 29' E.$), on the western coast of Buka Island, 10 miles from Cape North, lies within and southward of North Entrance Point, and is sheltered by the barrier reef and islands, which lie parallel to the coast southward of the point at the distance of about $2\frac{1}{2}$ miles. It is nearly 6 miles in length, well sheltered, and has good holding ground in a moderate depth of water, with a good entrance for large vessels on either side of Entrance Island and its reefs. There are generally breakers on the barrier reef, which partly uncovers at low water.

For the passage southward, within the barrier, note the preceding remarks.

Natives.—Hetau (North) Island, on the barrier reef, to the southward of the southern entrance to Queen Carola Harbor, is small but thickly populated. The inhabitants are of powerful build and possess good supplies of coconuts and bananas, as well as a number of pigs. No fresh water is procurable.

Coasts.—The northern and eastern coasts of Buka Island are bold, wooded, and appear to be steep-to, and without anchorage. Hanahan Bay, about 4 miles southeastward of Cape North, is a scarcely perceptible bend in the coast.

King Albert Strait (Buka Passage).—The western part of King Albert Strait is much obstructed by reefs and islets, and is

therefore difficult to navigate, but the eastern part is clear and about $\frac{1}{2}$ mile wide. Though the tidal stream runs through with strength, good anchorage may be found. In this locality there are several native villages. King Albert Strait is marked by beacons.

ISLANDS NORTHWARD OF THE SOLOMON GROUP.

Carteret Islands, situated about 45 miles north-northeastward of Bougainville Island, were discovered in 1767; they are six in number, and are situated on a circular coral reef about 10 miles in diameter. On the eastern side the reef is broadest, and here there is no passage into the lagoon, the sea breaking heavily on it at times.

On the western side the reef is much narrower and there are two passages in the southern part. Four islets are situated on the eastern part of the reef and two on the western. All are inhabited and thickly wooded, with coconut trees on the beaches. On the reef there are also several coral bowlders, which have no doubt given rise to the report of the number of islands being nine.

Piuli Yeharno, Jolas (Yovo), and Ibuene (Iriñalan) are situated on the eastern side; and Yeccla (Sila), with trees about 60 feet high, and Jangain (Green) Island, on which there is a trading station, on the western.

Marqueen or Mortlock Islands, about 90 miles eastward of Carteret Islands, were discovered in 1616, when the name Marqueen was given to them. They are probably identical with the group seen and named Cocos in 1790; and also with those known as the Massacre Islands, where a crew was cut off by the natives in 1830.

They consist of 13 low coral islets, covered with coconut trees, situated on an atoll reef about 8 miles in diameter. Twelve of the islets are close together on the eastern side of the lagoon, and one by itself on the western side. The southernmost islet is the largest, and is inhabited.

There are two passages into the lagoon—one on the south-south-west and the other on the western side about a mile from the islet.

The islands belong to Germany.

Ongtong Java or Lord Howe Islands, the native name of which is Leueneuwa, as well as that of the largest island, are situated about 130 miles east-southeastward of the Marqueen Islands and to the northward of Ysabel Island. This group was probably discovered in 1616, and again seen in 1643 and given the name Ongtong Java, and it was subsequently identified with the Lord Howe Islands in 1791. The position of group as charted is reported to be incorrect, as also the general detail.

The British flag was hoisted and a protectorate declared by the resident commissioner of the Solomon Islands August 30, 1900.

Two firms have stations in the group; one at King Uila's village, on the southern part of Leueneuwa Island, the King being the agent, and the other, with a European agent, at Anualeva Island, 3 or 4 miles westward of Kaveiniu Pass. Each firm owns a schooner, which calls at the group to collect copra.

Ongtong Java consists of a number of small, low, sandy islands situated within and around the edge of an atoll reef measuring about 35 miles across in an east-and-west direction, and with a greatest width of 18 miles. The islands are low, covered with coconut trees, and, in 1900, the population was estimated at from 3,000 to 4,000, inhabiting five or six islands, the natives being found to be friendly, many of them speaking English fairly well and understanding Samoan.

Supplies.—Fish in small quantities and a few yams and fowls can be obtained; pigeons are very plentiful.

Passes.—The British naval vessel *Torch* entered the lagoon by a pass northwestward of Kalan Island, which is densely wooded and marked by a conspicuous clump of high trees, and proceeded through the lagoon to an anchorage westward of Leueneuwa Island.

When making this pass care is necessary not to mistake a conspicuous tree on Keila Island for the clump on Kalan, which latter is nearly 6 miles farther northeastward.

There are several reported passes into the lagoon; the two following were used by the British naval vessel *Torch* (1905):

Kaveiko (lat. $5^{\circ} 31' S.$, long. $159^{\circ} 41' E.$), the eastern pass, entered about $1\frac{1}{2}$ miles south-southwestward of Leueneuwa Island and eastward of Akoo Island, is about 100 yards in breadth, with no sharp turns, and the reefs on each side, drying at low water and being steep-to, are clearly defined. The sea breaks heavily on the reefs at the entrance to the pass, and it is probable that, with strong south-east winds, one of the openings westward would be preferable, but this pass has the advantage of leading almost to the anchorage, and, although there are several small shoals to be negotiated after leaving its inner end, they can be plainly seen from the masthead and avoided.

Kaveiniu Pass, nearly 3 miles west-southwestward of Kaveiko Pass, is a good broad passage apparently free from danger, the reefs on either side being plainly visible from the masthead. There is a coral bank on the western side of the inner part of the passage, and several detached coral heads exist in the route between this passage and the anchorage.

Anchorage (lat. $5^{\circ} 30' S.$, long. $159^{\circ} 42' E.$).—The British naval vessel *Torch* (1905) anchored, in $14\frac{1}{2}$ fathoms water, with the northern extreme of Leueneuwa Island bearing 13° , being fairly close to the shore.

The barkentine *Lord of the Isles* (1882) entered the lagoon by a passage on the northern side with 3 fathoms water in the center and passed out by the northwest passage, in which 6 fathoms was obtained.

Frindsbury Reef, on which a whaler of that name was wrecked in March, 1882, is a coral patch on which the sea breaks heavily. Its position, which is doubtful, is about 15 miles northwestward of Ongtong Java Reef. The vessel probably ran on that reef.

Current.—In the month of July the set of the current experienced near the group was W.N.W., at the rate of from 2 to 2½ knots an hour.

Earthquake.—The British bark *Pacific Slope* reported having experienced a shock caused by volcanic eruption in the neighborhood of the Ongtong Java Islands March 3, 1878. A great quantity of pumice stone was afterwards found floating around the ship.

Roncador or Candelaria Reef, charted about 43 miles southward of the Ongtong Java Group, was seen by the pilot Maurelle in 1781, who passed it in the night, and from the noise made by the breakers called it Roncador (Snorer). In 1567 Mendaña discovered some reefs, which he named Baxos de Candelaria, and these are taken to be identical with the reef seen by Maurelle. The position is reported to be considerably to the eastward of that charted.

The reef is about 18 miles in circumference, having two openings in the southwestern part. The British naval vessel *Beagle*, in 1875, entered by the southern one. On the western side of the reef there are several rocks above water, the northern one being 10 feet high. Between this rock and another, 6 feet above high water lying nearly 3 miles southward of it, the reef is dry. The sea breaks heavily on the weather reef.

Anchorage.—The lagoon affords anchorage in depths of from 15 to 20 fathoms broken coral. The patches are easily seen from the masthead when the sun is favorably situated.

Fish is plentiful in the lagoon.

Tides.—It is high water, full and change, at Roncador Reef at 3h. 30m.; rise 6 feet (approximate).

Tasman Islands, or Niumanno Atoll (lat. 4° 35' S., long. 159° 30' E.), about 33 miles northward of the Ongtong Java Group, were first seen by Tasman, and the discovery was verified in 1824. The group, which is under German protection, consists of about 39 islets situated on an atoll reef about 7 miles across in a north-and-south direction by 11 miles east and west. The islets are small, low, and covered with coconut palms about 100 feet above high water.

On the western side the reef is not continuous, thereby affording several passages into the lagoon, in which there are many coral patches. The British naval vessel *Torch* (1900) visited this group

and entered the lagoon by the northern pass on the western side of the atoll. Two shoals were found on the northern side of the pass, but the southern side was clear.

Anchorage.—There is anchorage, in about 17 fathoms water, in several places; and near the southern corner of the atoll in a depth of 10 fathoms, westward of the south extreme of Niumanno, the easternmost and largest island, which is the only one inhabited, the population being about 200, and the inhabitants friendly. Several patches with a depth of $1\frac{1}{2}$ fathoms over them exist in the locality of the latter anchorage.

CHAPTER XIII.

BISMARCK ARCHIPELAGO—NEU MECKLENBURG, NEU POMMERN, ADMIRALTY ISLANDS, AND OTHERS ADJACENT.

Islands and reefs adjacent (north and east) to Neu Mecklenburg.

Caution.—As many of the islands described in this chapter have only been partially examined, the remarks on them must be considered incomplete; and it may be added that, with the exception of a few harbors, the charts depend upon mere sketches.

Nissan (Sir Charles Hardy) Island, lying to the eastward of Neu Mecklenburg and westward of the Carteret Group, is horseshoe shaped, with the opening at the northwest side. It is about 35 miles in circumference and 197 feet above high water. Barahun and Sirot Islands, with reefs surrounding them, almost block up the opening, within which there is a large and sheltered space with depths of 13 fathoms and more water in places; but it is stated that no anchorage can be obtained outside. The entrance, in which there is reported to be a depth of only 16 feet, is apparently between Barahun Island and the northwest point of Nissan, on which is the village of Pokonien.

As the result of frequent observations, the officers of the German naval vessel *Cormoran* report that this group lies 4 miles farther eastward than the charted position; also that the west coast has a more northwesterly direction than shown.

Pinipel or Green Island (lat. $4^{\circ} 17' S.$, long. $154^{\circ} 12' E.$), 330 feet above high water and situated just northward of Nissan, is about 5 miles in length, with reef extending off its western side.

The shores both of Nissan and Pinipel are densely wooded with palms and mangrove bushes. Landing is only possible in a few places, the eastern sides of these islands being especially steep.

Feni (Wonneram) Islands.—These two inhabited islands, situated about midway between Pinipel Island and the coast of Neu Mecklenburg, are separated by a narrow channel known as Salat Strait, in the center of the northern entrance to which there is a rock with a depth of less than 6 feet.

Ambitle (St. John) Island, the southwestern, is $8\frac{1}{2}$ miles long north and south, 6 miles broad, and pear shaped, tapering to the

northward. It is 1,844 feet high at the southern part and conspicuous, but the northern part is low. Babase Island, the northeastern, is 873 feet high, $6\frac{1}{2}$ miles long east and west, and $4\frac{1}{2}$ miles across the broadest part.

An islet named Balum lies on the north side of Babase. The islands extend over a distance of 12 miles in a northeast and southwest direction.

When seen from a distance of from 30 to 40 miles these islands appear as five rounded hummocks.

Discolored water has been observed to extend about $1\frac{1}{2}$ miles from the eastern side of this group.

Kaan Islands, about 40 miles north-northwestward of Wonneram Island, are eight in number and densely wooded. The western island is of considerable height and connected with those eastward of it by a reef. The northern island, which is the largest, is low, and between it and the next to the southward is a channel 4 miles wide and apparently clear of danger. From the southwest point of the northern island a reef extends about $\frac{1}{2}$ mile in a southerly direction.

The islands are reported to lie 6 miles farther in a 265° direction than charted. The natives are described as being ferocious and armed with spears.

Abgarris or Fead Islands, about 75 miles eastward of the Kaan Islands, are a chain of atoll islands and sandbanks surrounded by reefs and extending about 30 miles in a northwest and southeast direction.

On the western side the reef is broken up, affording passages to the smooth water within. That northward of Huhunati Island on the southwest side is charted as being good, and it is reported to be 200 yards in width, with depths of from 5 to 6 fathoms in it. Goodman or Nugarba Island, the largest of the group, is situated near the southeast extreme.

Sable Island (lat. $3^\circ 32' S.$, long. $154^\circ 43' E.$), surrounded by a reef, lies about 8 miles southwestward of Nugarba. It is about 8 feet high.

Gerrit Denys Island lies about 35 miles northwestward of the Kaan Islands and nearly 25 miles off the coast of Neu Mecklenburg. It is 1,640 feet above high water, and in most cases the slopes of the mountains are cultivated. The northwest coast is steep and rugged, while the southwest is fringed with palms and mangroves. The island is reported to lie 3 miles farther south than charted.

Luise Harbor.—On the eastern side of the island the coast is low, with some huts and palm trees on it. Here is situated Luise Harbor, a small bay formed by the extremities of two mountain ridges and open between northeast and east. The harbor is divided by a projecting rock, about 100 yards southward of which is the anchorage,

in from 9 to 35 fathoms water. The northern portion of the harbor is shallow. Landing appeared impossible at the time, owing to the heavy surf on the beach.

San Bruno and San Antonio, with a small islet between them, are situated on the same reef, close off the northeast side of Gerrit Denby's Island. San Bruno is low and San Antonio of moderate height. Both are well wooded and apparently steep-to. The natives of these two islands are friendly but shy and have little to barter.

San Joseph, 4 miles northward of San Bruno, is about 650 feet above high water with steep shores. A narrow white sandy beach with coconut trees on it was observed on the eastern side.

San Francisco, 7 miles farther northward, is also about 650 feet above high water, densely wooded and even topped, with steep coats. It appeared to be thickly populated.

Gardner Island, about 35 miles west-northwestward of Gerrit Denys, has steep shores. On the western side there is a bay, where shelter may perhaps be obtained during easterly winds. It was not, however, examined, on account of the heavy swell.

On the eastern side of the island, abreast Tatau Village, there is a low island, separated from the mainland by a narrow channel.

There is an island, 1,598 feet above high water, close southward of Gardner Island, separated from it by a channel which is navigable, the least depth found in it being 9 fathoms.

Anchorage may be obtained at either entrance to the channel, that at the eastern end being preferable.

Fisher Island, close northward of Gardner Island, is about 980 feet above high water. Its shores are steep and landing is difficult. The natives seemed friendly and willing to trade (1876).

Reef.—A reef, on which the sea breaks heavily in bad weather, extends for a distance of 6 miles from the western side of Fisher Island and is apparently joined to the coast.

Lyra Reef (lat. $1^{\circ} 53' S.$, long. $153^{\circ} 28' E.$), about 100 miles east-northeastward of Fisher Island, was reported in 1826 by the master of the *Lyra*. It is a narrow belt of rock extending 21 miles in a northwest and southeast direction, and the estimated depth on it is from 4 to 5 fathoms.

The position given is that of the center of the reef, but it could not be found in this locality in 1861.

For islands and dangers to the northward, see the Caroline Islands, etc.

St. Matthias Island (lat. $1^{\circ} 17' S.$, long. $149^{\circ} 31' E.$) is charted at about 45 miles north-northwestward of Neu Hannover. It is about 19 miles in length in a northwest and southeast direction, 9 miles in greatest breadth, and 2,130 feet above high water, and

should be visible from a distance of 45 miles in clear weather. On an easterly bearing it appears wedge shaped, the perpendicular side of the wedge being to the southward. Toward the southern end of the southwest side are a number of coral reefs and islands. The approximate position given is that of its northern point.

Anchorage.—The German naval vessel *Cormoran* passed between the southwest side of St. Matthias and the above-mentioned islands and anchored in a depth of 19 fathoms to the southeastward of the trading station, which is on a small island standing by itself. The passage between the reefs was reported to be clear and free from danger, but at the eastern entrance a reef, which may be easily seen even in a heavy sea, extends from the north into the deep fairway.

The British naval vessel *Blanche* (1872) was obliged to leave without communicating with the natives, who were most anxious to do so, both men and women coming off in their canoes and waving green boughs.

Current.—Between Neu Hannover and St. Matthias Islands the current was found to be setting to the west-northwestward at a rate of about 1 knot per hour.

Squally Island, sighted by Dampier (1699), was so named on account of the weather he then experienced. It lies from 15 to 20 miles eastward of St. Matthias and is about 10 miles long, not high, but undulating and thickly wooded, and, seen from the northwestward, it appears saddle shaped toward its northern and flattened toward its southern end. This island is of irregular form, about 9 miles long in an east-southeast and west-northwest direction and 5 miles broad. The island is inhabited.

Neu Mecklenburg (New Ireland)—General remarks.—Neu Mecklenburg is the northeasternmost of the large islands lying off the northeast coast of New Guinea, all of which now form part of the Bismarck Archipelago and are included in the German protectorate. The island is about 190 miles in length in a northwest-and-southeast direction, with an average breadth of about 15 miles.

Generally the northern coast is bold to approach, with a clear passage between it and the offlying islands. The northwest part is of coral formation and fringed with reef, and for 20 miles southeastward of North Cape consists of flat land slightly elevated toward the interior.

From about longitude 151° E. the mountain ridges become higher and steeper, attaining an elevation of about 2,000 feet at about 60 miles to the eastward, where there are two remarkable dips, the land falling first to 600 feet and then, after a slight rise, to 300 feet above high water.

Eastward of these the interior becomes broken up into numerous peaks varying from 2,000 to 2,600 feet in height, and near the north-

east point it reaches an elevation of 7,000 feet. From this point to Cape St. George (the southeast point) the same high and rugged hills continue. The mountains are thickly wooded to the summits, and only the lower spurs are inhabited.

Mission stations have been established near Cape Rossel, on the western coast, and probably at other places.

Tench Island.—This island is of oval shape, about $\frac{1}{2}$ mile long and $\frac{1}{4}$ mile broad, being wooded on the western side.

Reefs extend for about 300 yards from the coasts on all sides except at one position on the west coast, where landing can be effected.

Position.—The position of Tench Island is considered to be in latitude $1^{\circ} 40' S.$, longitude $150^{\circ} 41' E.$

Inhabitants.—Neu Mecklenburg appears to be well populated, the natives being Papuans, and though physically inferior to those of some of the Solomon Islands, they are similar in appearance, and, like them, vary in color from dark copper to pure black. Formerly they were atrocious cannibals, treacherous and cunning. Their canoes are large and well constructed, being generally elaborately carved, and some of them are capable of carrying 40 or 50 men. They cultivate the land to a considerable extent, and bananas, yams, and taro are grown in large quantities.

Cape St. George (lat. $4^{\circ} 51' S.$, long. $152^{\circ} 54' E.$) is the southeast extreme of Neu Mecklenburg, and a point about 3 miles northeastward of it is reported to be about 5 miles farther eastward than charted. The land is high and rugged within it, as before stated.

Lavinia Bay, situated about 1 mile northeastward of the cape, affords good anchorage during westerly winds in depths of from 5 to 7 fathoms, over sand, within the bluff forming the southern side of the entrance. A large stream discharges into this bay.

Likiliki Bay, 5 miles northeastward of Cape St. George, was the site of a proposed settlement in 1877, but the settlers nearly all died from hardships.

Northeast coast.—Cape Santa Maria, about 40 miles north-northeastward of Cape St. George, is the easternmost point of Neu Mecklenburg and about 3,000 feet above high water. It is reported that this part of the coast extends farther to the eastward than charted. From Cape Santa Maria the coast has a north-west direction for about 35 miles to Cape Matanatamberan, and this part of the island is known as the Luru district. From the cape it continues its northwest direction for about 120 miles to Cape Sass, and is very imperfectly known; thence to North Cape, a distance of about 30 miles, it has been partially examined.

Muliamma and Namatanai Harbors, situated, respectively, about 15 miles southeastward and 25 miles northwestward of Cape Ma-

tanatatamberan, afford anchorage for small vessels; the former protected from all winds and the latter, where there is a Government station, open between northwest and northeast.

Porpop Harbor, situated about $2\frac{1}{2}$ miles southward of Cape Matanatamberan, is nearly 1 mile long in a north-northwest and south-southeast direction, and from 150 to 500 yards wide between the reefs, the narrowest part being at the south end, just within the entrance. Its eastern side is formed by a reef with 3 to 6 feet water on it, which extends 1,350 yards southward from a point of land near Porpop Village, and has an islet on it named Baimsin, on which are some trees, lying 200 yards from the point. The entrance is about 200 yards long, and less than 200 yards wide between the south end of the reef just mentioned and a projection northward from the shore reef. A narrow reef, 200 yards long north and south, with 4 to 6 feet on it, lies in the middle of the harbor about 400 yards within the entrance. The west shore of the harbor is bordered by a reef. The general depths in the harbor northward of the detached reef are from 8 to 11 fathoms, and in the entrance from 9 to 18 fathoms. The direction of the entrance channel from seaward is about west-southwest, and a sharp turn of about eight points to the northward leads up the harbor.

Elizabeth Bay, situated westward of Cape Matanatamberan, affords anchorage in a depth of 19 fathoms, somewhat protected from the northward by shoals.

Namatanal Harbor.—Malum Point, the east entrance point of the harbor, is fringed by a reef, which extends about $\frac{1}{2}$ mile from the shore.

Kapsu Road, about 19 miles east-southeastward of North Cape, affords indifferent anchorage, in a depth of 13 fathoms, owing to the heavy swell that sets into the bay and to the confined space within which a convenient depth can be obtained.

A boat passage through the reef exists opposite the site of the trader's house.

Beacons.—Two beacons in line bearing 279° lead to the anchorage in about 19 fathoms water, about 200 yards distant from the boat passage. The eastern beacon, painted white, is surmounted by a triangle, apex up, and the western beacon, painted red, by a triangle, apex down.

Tidal streams.—On the northeast coast of Neu Mecklenburg the flood stream sets northwestward and the ebb to the southeastward. A southeasterly current is reported to be constant during the north-west monsoon.

North Cape, the northernmost point of Neu Mecklenburg, is a low promontory covered with coconut trees.

Southwest coast—**St. Georges Channel** separates Neu Mecklenburg from Neu Pommern, and its fairway is apparently free from dangers. The Neu Mecklenburg side may be approached within a short distance, but there are reefs on the Neu Pommern side extending about a mile from the shore.

Current.—Sailing vessels proceeding southward during the south-east trade are recommended to keep close to the Neu Pommern coast, thereby taking advantage of an eddy current setting to the southward, and by making short tacks avoid the northerly current in mid-channel. Wide Bay should be avoided, as the current appears to set strongly into it, and there might be a difficulty in getting out again.

In September, 1914, the current in St. Georges Channel was found setting sometimes as much as 2 to 3 knots an hour to the north-northwestward. To the northward of the channel it set 1 knot to the northwestward.

To the eastward of Cape St. George the current set to the north-northeastward at the rate of 32 miles a day.

Port Praslin, situated about $1\frac{1}{2}$ miles north-northwestward of Cape St. George, affords anchorage in depths of from 25 to 30 fathoms, with apparently good holding ground. It is protected from the northwest monsoon by Wallis and Green Islands, but when blowing hard from the southeast heavy gusts come over the highland in the vicinity.

Water.—Good water can be obtained from a stream in the south-east corner of the port.

Gower Harbor is the name given to a portion of the channel between Wallis Island and the coast of Neu Mecklenburg, but the depth, being about 50 fathoms, is too deep for anchorage.

English and Irish Coves, situated on the main island northward of Wallis Island, are also deep. Thence to Booby Rock, situated about $\frac{1}{4}$ mile off the peninsula, and within which is Port Sulphur, the coast is fringed by reef, but no soundings have been taken off it. Within is a range of hills about 2,000 feet above high water.

Port Sulphur, $\frac{3}{4}$ mile in length by 400 to 600 yards in breadth, affords anchorage in from 24 to 27 fathoms water and is easily accessible under sail.

The best approach is southward of Leigh Island, avoiding the reef fringing the peninsula.

Coconut Island (lat. $4^{\circ} 41' 26''$ S., long. $152^{\circ} 44' 30''$ E.), situated about 2 miles northwestward of Booby Rock, is about $1\frac{1}{2}$ miles in length and 800 feet above high water. The channel between it and the main island is $\frac{1}{2}$ mile wide and named Carteret Harbor. Leigh Island lies southward of Coconut Island, in the approach to Port Sulphur.

Supplies of pigs, fowls, yams, taro, etc., are procurable in small quantities from the village on the island, and fish may be taken with the seine, but it is probable that some of them are poisonous.

Carteret Harbor is easy of access, but should not be entered at night in a sailing vessel with easterly winds, which are baffling.

Anchorage.—The best anchorage is off the northeast part of Coconut Island, but the depths are from 30 to 35 fathoms at 250 yards from the shore.

Water may be obtained in Watering Bay, a cove on the main island, on the northern side of Carteret Harbor, where the water is deep, and a small craft may make fast to the trees.

Tides.—The tides are irregular and the rise is approximately 6 feet.

Coast.—From Carteret Point the coast has a north-northwest direction for about 13 miles to Hunter Point, whence it turns northward and northwestward, forming a bay 60 miles across, to Cape Givry. About midway is Cape Rossel, northward of which are mission stations. From Cape Givry the coast continues in a northwesterly direction for about 22 miles to Cape Strauch. Many small inlets with villages are seen, and the hills are cultivated. From Cape Strauch, a wooded tongue of land, the coast continues its northwest direction for 18 miles to Seelhorst Point, and thence about 6 miles to Wachenhusen Point, northwestward of which is Katharine Haven.

Katharine Haven is about 600 yards in width by the same in length, affording anchorage, in a depth of about 27 fathoms, of an indifferent and exposed nature, being open to the southward and westward. This haven may be recognized by two wooded rocks which lie southward of it. There is a similar but smaller bight at about 1 mile northward of Katharine Haven, and a still smaller one $\frac{1}{2}$ mile beyond. Small streams discharge into them.

Excepting in these bights, the coast is fronted by reef to the distance of from 200 to 600 yards.

Supplies.—The natives near Katharine Haven possess pigs, and supplies of fruit and vegetables are obtainable.

Coast.—From Ahlefeld Point, westward of the bights above mentioned, the coast continues its northwestward direction for about 11 miles to Rittmeyer Point, eastward of which it appears nearly free from offlying dangers, the shore being for the most part precipitous and steep-to with deep water within a short distance.

Westward of Katharine Haven the numerous chains of hills and spurs, more or less cultivated and with watercourses between them, change their outlines and become more uniform in aspect. From Rittmeyer Point the coast continues its northwesterly direction for about 18 miles to a point, off which is situated Angriffs Island.

Angriffs or Attack Island, the latter name being given to it on account of the natives having here made an attack on a boat belong-

ing to the German naval vessel *Gazelle*, is connected with the main island by a reef, close to the southern side of which there is a depth of 25 fathoms.

Dorf Haven, about 7 miles northwestward of Angriffs Island, is protected on its eastern side by a reef. The depths vary from 10 to 30 fathoms, but the space is so limited that it is necessary to moor, and it is only suitable for small craft. There is good water obtainable from the stream here.

Villages in the vicinity of Dorf Haven are numerous, some being built on steep heights. No supplies were obtainable in 1887.

Holz Haven (lat. $2^{\circ} 47' S.$, long. $150^{\circ} 59' E.$), situated 5 miles northwestward of Dorf Haven, with Zeye Point between, is about 800 yards in length in a northerly direction by 400 yards in breadth. Its entrance is narrowed to the breadth of 200 yards by coral reef extending from both points. The northern portion of the harbor shoals rapidly and is filled up with a mud flat. The shores are lined with mangrove trees, and being swampy this harbor is probably unhealthful.

Anchorage.—There is anchorage, in a depth of about 15 fathoms, avoiding a patch with $2\frac{1}{2}$ fathoms water over it, near the center of the harbor, the position of which is doubtful.

Directions.—Mount Bendemann, the prominent northern peak of Sandwich Island, which is situated about 11 miles southwestward of Holz Haven, bears 220° from the entrance. In entering it is necessary to make allowance for the tidal stream or current, which appears to set across.

Tides.—It is high water, full and change, in Holz Haven at about 2h. 50m., and the rise and fall is about $3\frac{1}{4}$ feet.

Tidal streams.—There is only one tide in the 24 hours, the flood running for about 14 hours and the ebb for about 10 hours.

Johanna Bay, about 5 miles westward of Holz Haven, affords anchorage for small craft only, being very confined.

Sandwich Island, from 6 to 8 miles distant from the coast of New Mecklenburg, from which it is separated by Gazelle Channel, is triangular, nearly 14 miles in length in an east-northeast and west-southwest direction, and of an average height of about 200 feet, except toward the northwest end, where there is a conspicuous hill, named Mount Bendemann, 820 feet above high water.

The south coast was examined by the British naval vessel *Beagle*.

Brown Point is the eastern extreme of Sandwich Island. A reef extends about 100 yards off the point.

Patchy Bay (Karri), close westward of Brown Point, is about a mile across and $\frac{1}{2}$ mile deep. It has a narrow fringing reef and several coral patches are scattered over it.

Midway between the outer points of Patchy Bay no bottom could be found at 28 fathoms.

Coast.—The coast from Patchy Bay trends southwestward for about 2 miles to Deep Bay and is fringed with coral.

Deep Bay (Majang), $1\frac{1}{2}$ miles wide, is much encumbered with coral patches. It has a white sandy beach with coconut trees, and its shore is fringed with reef extending for a distance of about 300 yards. No bottom at 25 fathoms could be found close up to the coral patches.

At distances of 1 and 2 miles westward of Deep Bay coral spits extend offshore for a distance of $\frac{1}{4}$ mile. About 2 miles westward of Deep Bay the shore becomes lined with mangroves and the reef fringing the shore widens.

Beagle Point, the southwest extreme of Sandwich Island, has a coral reef stretching to the southward for a distance of 3 miles. Several boulders, which do not cover at high water, are scattered over the reef.

Redlands Island is the larger of two islands situated about a mile northwestward of Beagle Point. Coconut and breadfruit trees were observed growing at the northeastern end of this island, and there were signs of the former existence of a village.

Archway Islet (lat. $3^{\circ} 00' S.$, long. $150^{\circ} 46' E.$), about 400 yards northwestward of Redlands Island, is small and has a natural archway through it. The estimated height of this islet is 20 feet above high water.

Reef having within it deep water with numerous coral patches extends westward and northward of these islands.

The channel between Sandwich Island and these islands was found to contain numerous coral patches, and, though possibly navigable by a small steamer, should not be made use of before a closer examination has taken place.

Supplies of coconuts and taro were brought off by the natives of Neu Mecklenburg, Sandwich, Neu Hannover, and Portland Islands, which were eagerly exchanged for hoop iron and beads.

Gazelle Channel separates Sandwich Island from the mainland of Neu Mecklenburg, and is about 6 miles across, its entrance from the westward being well marked on the north side by Dietert Peak and on the south by Mount Bendemann of Sandwich Island.

A reef which extends about a mile from the shore fringes the northern coast of Sandwich Island, but otherwise the channel appears deep and clear of dangers close up to either shore.

Current.—A current was experienced of about 1 knot an hour setting in a westerly direction through the channel, but it did not extend beyond the limits of the channel on the coast of Neu Mecklenburg.

Baudissin Island (lat. $2^{\circ} 44'$ S., long. $150^{\circ} 40'$ E.), situated off the western extreme of Neu Mecklenburg, is about $5\frac{1}{2}$ miles in length in a west-northwest and east-southeast direction and separated from the main island by Albatross Channel. The plan shows a depth of $4\frac{1}{2}$ fathoms at the southern entrance, and shoals, with 2 fathoms water over them, between Baudissin and Manne Islands. The eye is the only safe guide.

Shoal.—A shoal about 50 yards in diameter, with depths of $1\frac{1}{2}$ fathoms over it, is situated 198° from the northwest point of Manne Island.

Cape Jeschke, the western extreme of Baudissin Island, is fringed by a reef, which is steep-to, with several rocks on it, dry at low water.

Steffen Strait, between Cape Jeschke and Vutte, and several smaller islands on the eastern, and Selapiu, Bangattan, and smaller islands on the western side, is named after an officer of the *Gazelle*, who was wounded there by the natives. It is about 8 miles in length, less than $\frac{1}{2}$ mile in breadth at its narrowest part, and is obstructed at its southern entrance by a shoal with less than 6 feet water over it.

About $\frac{3}{4}$ mile northwestward of the preceding shoal is another with 3 fathoms water over it, otherwise the depths in the channel are from 23 to 44 fathoms.

Tidal streams.—The tidal streams run through this strait at the rate of about 2 knots an hour, the flood to the northward and the ebb to the southward.

Channels.—From the plan there are apparently two channels from Steffen Strait leading to Kawieng Harbor, the southern being entered between Kulaunus and Nanavaul Islands and the northern between Vutte and Lemus Islands. Directions are only given for the southern channel.

Anchorage in the southern channel is shown between Globig and Lisseno Islands.

Dangers.—A shoal with $1\frac{3}{4}$ fathoms water over it lies $1\frac{1}{2}$ miles 273° from Lisseno Island.

A spot with a depth of $1\frac{1}{2}$ fathoms over it extends in a 279° direction for about $\frac{3}{4}$ mile from Lisseno Island.

The Eruk Islands are surrounded by shoal water, which extends about $1\frac{1}{2}$ miles 259° from the southern extreme of Globig Island.

Directions.—Having passed between Kulaunus and Nanavaul Islands, steer 72° with the northern extremes of Lisseno and Usseinlik Islands in line, until the eastern extreme of Schneider Island is just touching the western side of Globig Island (Eruk Islands), bearing about 13° , when this course should be followed until a house on Kabotteron Island is in line with the northern steep slope of Mausoleum berg 260° , and using this as a stern mark, steer 80° . The least depth found on these courses is said to be 5 fathoms.

The following directions lead through Steffen Strait from the southward to the southern entrance to Kawieng Harbor, by the northern or Nusa Channel. Pass $\frac{1}{2}$ mile eastward of the south extreme of Tsalampiu (Selapiu) Island on a 17° course, until the first houses of the trading station on the south corner of Kabotteron Island are over the northwest point of Kulaunus Island when turn to starboard and keep the white house of the trading station just open of Kulaunus, bearing 55° , which leads between the reef extending from Tsalampiu (Selapiu) and the 3-fathom patch westward of Baudissin Island. Keep on this course until Kulaunus is quite open of Baudissin Island, when alter course to 1° for the south point of Lemus Island. When the southern edge of Nusalomon is shut in behind Nusaum, alter course to 75° for the south side of Edmago (Einfahrts or Entrance) Island, taking care to keep at least 330 yards from the south side of Nusaum. When Ral Island is on the port beam steer 85° for the white beacon on Cape Siwusat, until the flagstaff near the overseer's residence and the beacon of Kawieng are in line, when follow the directions for Kawieng Harbor.

Edmago Island stands out at a distance from the background, owing to two cypresslike trees. The reef surrounding the island extends for $\frac{1}{2}$ mile on the west side, between west and north, with a depth of $4\frac{1}{4}$ fathoms.

Kawieng Harbor, situated southwestward of North Cape, is formed by the Nusa Archipelago and the mainland of Neu Mecklenburg. It is nearly landlocked and affords anchorage in from 6 to 10 fathoms water over coral bottom. The space available for large vessels off the settlement on Nusa Island is confined, but there is ample room farther southward.

Settlement (lat. $2^\circ 34'$ S., long. $150^\circ 47'$ E.).—Nusa is a German trading factory on the eastern side of Nusa Island, and near it is the observation spot. Several trading stations are situated on the main island abreast of Nusa Island.

Supplies.—The natives of the island are friendly, and taro, yams, and pigs are procurable.

Pilots.—A native pilot may be obtained at the trading station on Nusa Island.

North entrance.—There are three entrances to the harbor. The northern, between the reefs off Nusa Island and Neu Mecklenburg, is about 150 yards wide between the reefs fringing both sides of it and obstructed by a bar having a depth of about 3 fathoms over it. In the fairway there are coral patches with $2\frac{1}{2}$ fathoms water over them. During the northwest season there is much swell in this entrance.

Rock.—A pinnacle rock with $1\frac{3}{4}$ fathoms water over it lies in the fairway, with Nusa Island observation spot bearing 254° , distant

840 yards, and Kaweing white beacon 135° . This rock is marked by a black barrel buoy.

Nissel Pass, between the reefs extending from Nusalik and Nago Islands, is nearly 400 yards wide between the 3-fathom edges and has a least known depth of 6 fathoms.

Rocks.—The three rocks, marked by a cross on plan, in the middle of the harbor, nearly abreast the boundary post, have less than $3\frac{1}{2}$ fathoms over them.

Nusa Channel, the southern entrance between Nago Island and Neu Mecklenburg, is about 700 yards wide and has depths of from 7 to 12 fathoms.

Beacons.—Nissel Pass beacon, situated on the main island, eastward of Nago Island, is surmounted by a triangle, with the apex pointing up.

Kawiang beacon, used as a mark for the southern entrance, is painted white and surmounted by a triangle painted white, with apex upward. It stands on the main island eastward of the southern end of Nusa Island.

Two beacons, painted red, are situated on the fringing reef off the northeast end of Nusa Island. The southern is surmounted by a triangle, apex up, the northern by a triangle, apex down.

A beacon, painted red and surmounted by a triangle, apex pointing down, and painted white, marks a detached shoal on the eastern side of the southern channel, and one painted black a similar shoal on the western side, and about 600 yards southeastward of Nusalik Island.

The beacons are not to be depended on.

Leading beacons.—As the Nusa beacons are at times difficult to make out, and their leading line passes very close to the reefs below Nusa, two white leading beacons, with triangle top marks, have been erected on the east side of the fairway, 590 yards apart, and in line bearing 11° .

The southern or front beacon stands on the reef abreast Monton store, and is, with its top mark, 18 feet high. The triangle has its apex upward and stands on the substructure.

The northern or rear beacon, 26 feet high, has the triangle apex downward at 3 feet above the substructure. It stands about 200 yards south of Cape Nuan.

The beacon on East Reef is white, and the black beacon situated 450 yards west-northwest of it has a square topmark, below which is a black St. Andrew's cross.

Buoy.—A black spar buoy, with black cylindrical topmark, marks a rocky patch of $3\frac{1}{2}$ fathoms situated about 450 yards northward of East Reef beacon. It serves for finding the leading line (flagstaff,

Kawieng beacon), upon which it nearly lies, as well as for avoiding the shoal marked by it.

Directions—Nusa Channel.—To enter Kawieng Harbor by the southern entrance or Nusa Channel steer for the beacon on Cape Siwusat on a 85° bearing until the flagstaff near the overseer's residence is in line with the beacon on the hill behind it 37° , which mark leads eastward of the reefs off Nago Island. If the beacon can not easily be made out, keep the black spar buoy in line with the flagstaff. As the leading line passes rather close to a patch of 3 feet lying eastward of the center of Nago, the beacon should be kept open eastward of the flagstaff when passing that island. When passing between the reef beacons southeastward of Nusalik Island, keep closer to that on East Reef. Round the black spar buoy on its east side at about 35 yards distance, and bring the two eastern leading beacons in line until the flagstaff near the overseer's residence comes in line with the left corner of that residence, when turn to anchor. The residence is difficult to make out, owing to brushwood and trees in front of it.

The Nusa beacons mark the western limit up to which the reefs should be approached.

Anchorage may be obtained in from 7 to 8 fathoms water, over coral sand, with the high flagstaff in line with the right-hand corner of the station dwelling house, bearing about 98° .

Directions—Nissel Pass.—Steer for the beacon on the shore opposite Nago Island, bearing 141° , until the highest flagstaff below the steps of the station is in line with the beacon on the hill at the back, 36° , when they should be steered for, leading between the two beacons on the reefs to the southeastward of Nusalik Island, and follow the directions for Nusa Channel.

Coming from the southward, see remarks on Steffen Strait.

Tidal streams.—The tidal streams run strongly between the coast and the islands, the ebb running to the southward at the rate of 2 knots per hour.

Byron Strait (lat. $2^{\circ} 40' S.$, long. $150^{\circ} 30' E.$) separates Selapiu Island from the islands on the barrier reef off the eastern side of Neu Hannover. These islands are low, densely wooded, and inhabited.

The strait is about 7 miles in length in a northeast and southwest direction, but its southern portion is only 600 yards wide, and in mid-channel there is a shoal with $1\frac{1}{2}$ fathoms water over it. The northern portion is wide and deep.

The natives in the vicinity of Byron Strait resemble those of Neu Pommern and appeared peaceable and friendly.

Anchorage, exposed to southerly winds, will be found in the southern entrance to the strait. Here a regular ebb and flood stream

was felt, setting southwest and northeast, respectively, at the rate of about 2 miles an hour.

Directions.—Byron Strait can not be recommended to a sailing vessel, as, in addition to the $1\frac{1}{2}$ -fathom patch mentioned, the strong tidal stream and eddies render navigation hazardous.

In order to avoid the central shoal vessels should keep close to the Durchfahrts Islets.

Barrier Islands—Senta Pass.—The islands forming the northwestern side of Byron Strait lie on the barrier reef which extends nearly to East Islands, the two central ones being named Kolebuat and Napassak.

Senta Pass is the channel close southward of these islands, abreast the north end of Neuwerk Island in Byron Strait.

The bar on the western side of its narrowest part is very foul, with several rocks on which there are depths of $1\frac{1}{4}$ fathoms and others with less water. This channel is dangerous for vessels drawing more than 7 feet water.

Neu Hannover, situated westward of Neu Mecklenburg, is about 37 miles in length in an east-and-west direction by about 18 miles in breadth, and consists of a mountainous ridge ranging from 1,200 to 1,600 feet above high water. Toward the eastern end of the island this ridge divides.

The northwest coast of the island has a belt of low coral land extending to the foot of the hills, and is fringed with reef to a distance of about 3 miles from the shore, having upon it many coral islets. No dangers were seen outside this reef, deep water apparently existing close to its edge. This part of Neu Hannover seemed thickly populated, judging by the number of villages seen in the vicinity.

Cape Queen Charlotte (lat. $2^{\circ} 30' S.$, long. $149^{\circ} 55' E.$), the western extreme of Neu Hannover, is low and apparently of coral formation. West Islet lies close southward of it, on the fringing reef.

North Haven, close northward of Cape Queen Charlotte, lies between the fringing coral reefs and an offlying reef. It affords sheltered anchorage, about 2 miles in length in a northeast and southwest direction, by 1,200 yards in breadth, having depths of from 13 to 18 fathoms, over a bottom of fine coral sand.

At the northern end of the outer reef is a sand cay, with bushes, distant 1.1 miles from West Island.

The beach in North Haven is fringed with coral reef, rendering landing in boats a matter of some discomfort. There is a village on the beach near Cape Queen Charlotte and another on West Island.

Natives.—The natives, although always armed with spears, appeared peaceable. No fresh water or supplies were obtainable.

Directions.—There are two entrances to this haven, one on the northern and one on the southern side. The latter is the better of the

two and has a depth of about 9 fathoms. The northern has several patches with 3 and 4 fathoms water over them.

Caution must be used when entering the southern channel to keep within 100 yards of the southern end of the outer reef, as the water on the southern side of the entrance shoals to 3 fathoms in places. With the sun in a favorable position no difficulty will be found in entering. Anchorage will be found off a clump of large trees, in a depth of 18 fathoms, where the fringing reef recedes in a bight to the coast line.

A channel also exists in the reef southward of Cape Queen Charlotte, toward West Island, but it is so narrow that it is not recommended for anchoring in.

Tides.—It is high water, full and change, in North Haven about 2h. 30m.; rise and fall about 3 feet.

Tidal streams.—Only one flood and one ebb tide were observed in the 24 hours, of which the flood ran for about 14 hours and the ebb for about 10 hours.

Caution.—It was reported (1906) that the north coast of Neu Hannover and its offlying islands are very incorrectly shown on the chart.

Islands.—Between North Haven and Cape Solomon Sweert, the north point of Neu Hannover, are several islands on the barrier reef, formerly known as the North Islands. The largest islands are said to be eight in number, the southernmost being named Kabian, and the others, Tachau, Kulik, Nakung, Donung (Junung), and Ne Ital. The latter is situated about 2 miles westward of the cape. Some of the islands have bushes on them.

Between Kulik and Nakung there is apparently a channel of deep water, which continues within Donung and Ne Ital to the cape. The shore abreast consists of fairly high land.

East Islands.—These islands, four in number, are situated upon the same reef, about 3 miles off the north coast of Neu Hannover. Between them Cape Solomon Sweert is a wide bay, in which depths of 10 to 18 fathoms were found.

Anchorage.—The German naval vessel *Condor* (1906) anchored between Kulik and Nakung Islands, which latter is the third large island, counting from the eastward.

The same vessel anchored near Ungalik Island, eastward of Cape Solomon Sweert, with the extremes of the island bearing 79° and 112°.

The British naval vessel *Conflict* anchored in a depth of 18 fathoms, with the northern extreme of the large East Island bearing 62°, distant 2 miles. The islands eastward, within which there is Ysabel Pass leading to Byron Strait, have been referred to with that strait.

Rock.—A large rock, just below water, is situated in the western part of Ysabel Pass, about 1 mile southwestward of Sebugul Island.

The south coast of Neu Hannover, from Cape Queen Charlotte, trends in a southeast direction for 3 miles to Cape Henk, a sharp wooded point, which at its extremity is about 40 feet above high water, and terminates abruptly; thence the coast trends eastward for about 3 miles, forming Marien Bay.

Marien Bay is a collection of small bights and coves, none of which appear to afford good anchorage. It is about 6 miles across.

Expedition Bay and Water Haven (lat. $2^{\circ} 36' S.$, long. $150^{\circ} 03' E.$) lie 4 and 6 miles southeast of Marien Bay, the latter of which affords fair, but deep, anchorage, exposed to the southwestward. Thence the coast continues southeastward for a distance of 10 miles to Cape Batsch, the southwest point of Neu Hannover.

Coast.—The whole of the south coast of Neu Hannover appears fringed with coral reef, but seldom to the distance of as much as $\frac{1}{2}$ mile, with deep water close to its edge and apparently no offlying dangers. Thence eastward to Byron Strait are a number of islands, as shown on the plan, of which but little is known.

Mount Stosch, situated within Cape Batsch, is prominent and bluntly conical in shape, rising above the neighboring hills to a height of 1,857 feet above high water.

Portland Islands, about 18 miles west-southwestward of Cape Queen Charlotte, are four low wooded islets, extending in a north-east and southwest direction, and situated on the eastern part of a crescent-shaped coral reef, which is about 5 miles in length and apparently steep-to. The group is reported to lie farther to the westward than its charted position.

Landing may be effected at the northeast end of the northernmost island through a break in the fringing reef.

The natives appeared peaceable and without weapons of any description. The total number was estimated at 100. Espiègle, 1883.)

Neu Lauenburg (Duke of York Island).—This group, situated westward of the southern end of New Mecklenburg, at the northern end of St. Georges Channel, consists of about 13 islands, of which Neu Lauenburg Island is by far the largest. Makada, 328 feet above high water, and Mauke (Ulu) are the only others of any size. All the group, with the exception of Makada, are low, thickly wooded, and slightly cultivated. Mauke is the only one uninhabited, probably on account of its being considered unhealthy by the natives.

There are three harbors in the group, Makada, Mioko, and Balanawang or Port Hunter. Makada is the best place for watering, but

Mioko affords the best holding ground and the most sheltered anchorage.

Balanawang Harbor is not to be recommended on account of the inconvenient depth for anchoring, scarcity of fresh water, and also the difficulty generally experienced in a sailing craft when entering and leaving.

Settlements.—The chief German station is on Kerawara, on the southern side of the group. There is a German New Guinea Co.'s station on the west end of Mioko, eastward of Kerawara.

Missions.—There are several mission stations around the group.

Makada Harbor (lat. $4^{\circ} 09' S.$, long. $152^{\circ} 26' E.$), formed by Makada Island and the northwest portion of Neu Lauenburg Island, is well adapted for small vessels, and has an average depth of 5 fathoms, over a sandy bottom.

Supplies.—Fish, and occasionally pigs and fowls, are brought on board by the natives, but vegetables are scarce. Water of good quality may be obtained on Makada Island, northwestward of Watering Point, from a stream in the bush.

The natives of Neu Lauenburg are friendly.

Beagle Rock, with about 4 feet least water over it, lies in the center of the southwestern entrance to the harbor, with West Point, on Makada Island, bearing 358° and Pinnacle Rock 104° .

Detached shoals, with depths varying from 4 feet to $2\frac{1}{2}$ fathoms over them, lie north-northwestward of Beagle Rock as far as the parallel of Cape Brown, the northwest point of Makada Island, and in a southwest direction to the parallel of Nakukuru Point, the western extreme of Neu Lauenburg Island, and as no written description of them would be of use, the navigator is referred to the chart for their positions.

Great Credner (Salacoora), Pigeon Islands, bearing 186° , is said to lead westward of all known dangers.

A patch with 4 feet water over it lies about $\frac{1}{2}$ mile northeastward of Beagle Rock, and the channel between Beagle Rock and West Point is encumbered with shoals.

The center of the channel southward of Watering Point is occupied by a shoal, with $3\frac{1}{4}$ fathoms over it, and patches with depths of 3 and $2\frac{1}{4}$ fathoms over them lie, respectively, about 400 and 800 yards southward of Urputput Point. The best channel is northward of the two latter. For others, more out of the fairway, see the plan.

The anchorage generally used is southward of Urputput (Spit) Point, the southeast extreme of Makada Island, in 4 fathoms water, over sand, about 250 yards from the beach.

Directions.—None of the outlying reefs uncover, so that a good lookout from aloft is necessary when entering Makada Harbor.

Entering Makada Harbor from the southward, Nakukuru and Uraputput Points in line, bearing 36° , lead up to the former point, which should be rounded at a distance of about 600 yards, to avoid the reef situated about 1,000 yards westward of that point.

From this steer about 18° to pass between Beagle Rock and a detached shoal, with $2\frac{1}{2}$ fathoms water over it, which lies about 800 yards from the shore of Neu Lauenburg Island, about midway between Nakukuru and Rukukuru Points, having passed which alter course for Uraputput Point and pass northward of the 3-fathom patch southward of that point, between which is the anchorage.

Northern channel.—The channel to the northward, between the northern part of Neu Lauenburg Island and the eastern side of Makada Island, has several shoals in it, with depths of from $2\frac{1}{2}$ to 3 fathoms water over them. Farther northward it is apparently clear of danger, but is narrowed to a breadth of about 400 yards by shoals extending about $\frac{1}{2}$ mile northeastward of Makada Island and the same distance northwestward of Mait Unanga (Bradley) Islet.

Mait Channel (Hernsheim Passage), between Mait Iri and Mait Unanga, has a least charted depth of 7 fathoms.

Tides.—In Makada Harbor it is high water, full and change, at 9h. 10m.; springs rise $2\frac{1}{2}$ feet, neaps rise 1 foot.

Tidal streams.—The flood stream runs about 7 hours to the northward and the ebb $3\frac{1}{2}$ to the southward, at the rate of from 1 to 3 knots an hour; the rise and fall is from 2 to 3 feet.

The current or tidal stream also sets strongly through the southern passage, and northward of the islets it sets strong to the westward.

Caution.—Between Makada Island and Mioko Harbor several shoal patches exist and great caution is requisite in the navigation.

Mioko Harbor (lat. $4^{\circ} 14'$ S., long. $152^{\circ} 28'$ E.) is the best in the Neu Lauenburg Group, being well sheltered, with good holding ground, and easy of access. The harbor is formed by the southern side of the Neu Lauenburg Island, the islands of Mauke, Utuin, and Mioko to the westward and southward, and Mualim Island to the eastward.

East (Levinson) Passage is the only entrance that can be recommended to vessels of any size, the northwest passage being dangerous for vessels of more than 13 feet draft.

Settlement.—The German South Sea Trading Co.'s station is situated on the western end of Mioko Island, and there are Wesleyan mission stations on Mauke, Utuan, and Mioko Islands.

Coal and supplies.—Coal, in small quantities, and provisions can be obtained at Mioko Harbor from the trade depot. The supply of coal is uncertain.

Beacons.—In the northwest passage beacons are placed on the western end of Ruruan Island and on the southwest point of Neu Lauenburg Island. They are in line when bearing 138° .

For the east channel there is a beacon on the southwest point of Mualim Island and one on the south side of Neu Lauenburg Island, which are in line when bearing 321° .

Anchorage.—The anchorage marked is in about 8 fathoms water, over sand, about 200 yards northward of the trading station on the western end of Mioko Island, but, referring to the plan, it will be seen that there are several shoal spots on its northern side.

Directions—East passage.—Approach the east passage with the beacons in line bearing 321° , which should pass nearly 200 yards northeastward of the shoal which extends from the eastern end of Mioko Island, and when nearing Mualim Island steer to pass nearly 200 yards from its southwest side to avoid the shoal off it, and one, which has $3\frac{1}{2}$ fathoms over its extreme, about 400 yards northward of Mioko Island.

Northwest passage (lat. $4^{\circ} 12' S.$, long. $152^{\circ} 26' E.$).—Vessels of less than 13 feet draft may use this passage, steering for the entrance with the beacons in line, bearing 138° , but when about $\frac{3}{4}$ mile from Ruruan Island the track, shown on the chart by a dashed line, which runs parallel to, and about 200 yards from, the northeast side of Mauke Island, must be followed.

During the southeast trade the northwest entrance should not be attempted by sailing vessels entering the harbor, as it is impossible to beat against the current, which at that time sets to the northward.

Tides.—The establishment and rise in Mioko Harbor are the same as for Makada Harbor.

Tidal streams.—The tidal streams attain a rate of from 2 to 3 knots an hour in the passages between the islands and reefs.

Balanawang Harbor (Port Hunter), in the northern part of Neu Lauenburg Island, is about 400 yards square and well sheltered from all winds except those between north-northeast and northwest. The depths are from 20 to 25 fathoms in the outer part and about 14 fathoms at 200 yards distant from its head.

No water can be obtained and but a small quantity of fresh provisions.

Current.—The prevailing current appears, near the Neu Lauenburg Islands, to be to the southward, but it is much affected by the monsoons. After a strong southeasterly breeze it will be found setting to the northward, but if this is succeeded by calm or light breezes it again resumes the southerly direction.

During the southeast monsoon an eddy current setting to the southward will be found close to the Neu Pommern coast.

The currents are stronger on the eastern than on the western side of the Neu Lauenburg Group, sometimes attaining on the former side a strength of 2 to 3 knots an hour or more.

Credner or Pigeon Islands, situated between Neu Lauenburg Group and Neu Pommern, are low and thickly wooded. Each island is surrounded by a reef, but there is a deep water passage between them.

Neu Pommern or New Britain is a crescent-shaped angular island lying between the southern part of Neu Mecklenburg and Cape King William, on the northeast coast of New Guinea. From Cape Tawui (Stephens), its northern extreme, the island trends in a southwesterly direction for 120 miles, and thence westward, turning to the northwestward, for 165 miles to its western extreme. It is about 60 miles in breadth in places, and the narrow isthmus of Gazelle Peninsula, the northern portion, is about 20 miles across.

The island generally is mountainous, and in the northern peninsula there is an active volcano, which was in violent eruption in 1878 when an island 60 feet in height was thrown up on the western shore of Blanche Bay. This eruption was succeeded by a seismic wave which washed away a large portion of Matupi Island; and the whole of Blanche Bay. This eruption was succeeded by a seismic wave. On the northern side of the island southward of Gazelle Peninsula and in Lolobau Island off it there are also active volcanoes.

Settlements.—The principal German settlement is at Herbertshöhe on the northeast side of the Gazelle Peninsula.

Missions.—There are several mission stations on the island.

Natives.—The inhabitants of Neu Pommern are similar to those of Neu Hannover and Neu Mecklenburg. They formerly were at constant war with each other, were all cannibals, and have at times been guilty of atrocious murders. Caution is probably still necessary when dealing with those distant from the German stations.

Gazelle Peninsula is the northern portion of Neu Pommern extending northward from the isthmus, situated in about latitude 5° S. The land composing this peninsula consists of many mountains, conspicuous among which are Mounts Towanumbatir, Kombiu, and Tavurvur, 1,768, 2,247, and 1,621 feet, respectively; Mount Beaupre, 1,640 feet, and Mount Wunakokor (Varzin), 1,985 feet above high water, all toward the northeastern part of the peninsula.

Mount Kombiu, which rises above Blanche Harbor, is conspicuous when seen from the southern entrance of St. Georges Channel; it makes as an isolated mound.

Cape Lambert (lat. 4° 11' S., long. 151° 32' E.), the northwest extreme of Gazelle Peninsula, is bold and steep, with two ranges of hills within it. About 2 miles westward of the cape there is a sand islet with a few trees on it.

Islets and reefs lie from 7 to 8 miles northward and westward of Cape Lambert, of which little are known. Of these the Scilly Islands, six in number (one of which is 60 feet above high water), lie to the northward; Elizabeth Reef, dry at low water and apparently volcanic, is situated northwest, and Norton Banks, some of which are dry, to the westward of the cape.

The Scilly Islands are reported to be incorrectly charted both as regards their positions from each other and from Cape Lambert, and about 8 miles westward of Norton Banks a shoal is charted, the existence of which is doubtful.

Beacons.—An iron beacon, about 20 feet above high water, with cone top mark, apex downward, painted black and white, has been erected on the reef $6\frac{3}{4}$ miles 355° from Cape Lambert.

An iron beacon, with round white top mark, has been erected for coastal traffic on a shoal of 2 feet lying northward of Tawanuk uss Bay and 1.3 miles from the shore.

Father and Son Reefs, two dangers, 3 miles apart in an east-and-west direction, are situated about 35 miles west-northwestward of Cape Lambert. The former and eastern is a round patch which breaks, the other a long reef.

Legelis Shoals, discovered in 1842, were described as being nearly level with the sea, with a deep channel 200 yards wide between them. They are charted about 20 miles 8° of Cape Lambert.

The commander of the German naval vessel *Elizabeth* reported the existence of a shoal, which is charted 325° , distant 16 miles from Cape Lambert, which consists of several rocks above water and shoal patches extending apparently over an area of about 2 miles.

It is considered that this shoal is identical with Legelis Shoals.

Horton Banks, southwestward of Cape Lambert, were reported to have on them two sand cays each about 3 feet above high water and about 5 miles apart. They were unsuccessfully searched for in an area about 18 miles in length in an east-northeast and west-southwest direction by about 7 miles in width, which is shown by a dotted line on the chart, but it is possible that they may be outside these limits; also that other outlying shoals may exist.

Watassellibuka (Byning) Bay, about 12 miles to the eastward of Cape Lambert, is a deep indentation in the coast having a reef on its eastern side between which and the shore there is anchorage for a small vessel. The remaining portion of the bay is deep.

Massava (Matava) Bay (lat. $4^\circ 13' S.$, long. $151^\circ 49' E.$), situated between Materbert Island and the shore, is a small but well-sheltered anchorage having depths of from 10 to 13 fathoms. The western entrance has a reef about 300 yards in extent in the fairway with a narrow passage on either side. The eastern entrance is wide and deep.

Water.—Good water may be obtained on the main island southward of the anchorage.

Materbert Island is about 250 yards in length, and the tops of the trees are about 110 feet above high water. It is situated on a reef which extends from 100 to 300 yards from it, except on its southern side.

Tides.—The tides are diurnal; high water, full and change, at midnight, and springs rise $3\frac{1}{2}$ feet.

Matukanaputa Island, situated northwestward of Materbert Island, is small, rocky, about 60 feet above high water, and covered with coconut trees.

Cape Ligan (Luen) is the northern entrance point to Ataliklikun Bay, 8 miles deep, on the eastern side of which, near its head, is Unter Kambeira or Port Weber. A reef extends about $1\frac{1}{2}$ miles northwestward of the cape.

Reefs extend $1\frac{1}{4}$ miles north-northwestward from the cape.

Ataliklikun Bay—Reef.—A reef awash, about 200 yards long east and west, with 15 and 19 fathoms around, on which the steamer *Seestern* struck in 1909, lies in the southwest part of Ataliklikun Bay, off Mondres mission and $\frac{3}{4}$ mile from the shore, with Cape Ligan bearing 37° , distant $7\frac{3}{4}$ miles.

Urara Island, about 3 miles westward of Cape Ligan, stands on a reef which extends a short distance only eastward of it and $1\frac{1}{2}$ miles to the westward.

Reimers Reef, on which the *Ysabel* struck in 1895, is charted as being $5\frac{1}{4}$ miles in length in a northwest and southeast direction, with its southeastern end a little northward of the western end of Urara Island Reef.

Unter Kambeira (Port Weber) (lat. $4^\circ 15' S.$, long. $152^\circ 2' E.$), situated on the eastern side of Ataliklikun Bay, affords good anchorage westward of the trading station in about 10 fathoms, over sand, about 800 yards from the shore, but the water shoals rapidly within the 5-fathom curve. On the northern and southern sides of the shallow bay, fronting the trading station, reefs extend about 400 yards from the shore.

Water and native supplies were obtainable.

Directions.—From the northeastward steer for Urara Island, bearing about south, passing westward of the reefs off Cape Ligan and between them and Urara Island, after which steer up the bay for the anchorage, distant about 5 miles, and avoiding the reefs which extend off the shore on either side of the bay fronting the trading station.

Tides.—The tides are diurnal and the establishment of the port uncertain.

Watom (Man) Island, situated about 5 miles off the coast between Capes Liguana and Tawui, is 1,115 feet above high water, having a broken ridge without any well-marked summit. It is deeply furrowed and covered with vegetation, the bare rock showing through, which gives a many-tinted appearance to the island. A narrow fringing reef extends from the western side of the island.

The passage between Watom Island and New Pommern is clear, with the exception of Kambawee Reef. Vessels are recommended to keep close to Watom Island, which is clear of outlying reefs.

Kambawee (Midway) Reef, situated about 5 miles eastward of Cape Liguana, is about 200 yards in length and just awash at low water. It is said to lie with the eastern extreme of Watom Island bearing 26° , and distant $\frac{3}{4}$ mile from the New Pommern coast.

Conflict Reef is charted near the shore, at about 3 miles 203° of Cape Tawui.

Talili (Kabakadai) Bay (lat. $4^{\circ} 12' S.$, long. $152^{\circ} 06'$) is the head of the bay situated between Capes Liguana and Tawui. Kambawee Reef lies in its western and Conflict Reef in the northeastern approach, both of which have just been referred to. The water is shallow for a long distance off its shores, the depths being less than 6 feet for 600 yards off its head, but the water deepens quickly above 3 fathoms.

Mission.—There is a mission house at Kambakanda on the bluff north point of the bay.

Anchorage.—The anchorage is in 13 fathoms water, with a white cliff at the head of the bay bearing about 240° , but the bank is steep, and the bay is not recommended except as a stopping place for the night. Anchorage is also reported westward of the mission house bluff, in a depth of 5 fathoms, with Mount Kombui bearing 99° and the eastern extreme of Watom Island 6° .

There are two other anchorages in Talili Bay. The first is off Kurakakual training station; the other, nearer Cape Tawui, is named Ratavul anchorage, and has depths of from 10 to 12 fathoms, over sand, with the beach bearing 164° distant about 600 yards.

Supplies of native produce and fresh water can be obtained at some of these anchorages.

Tides.—There is apparently only one tide in the 24 hours in the bays upon the north coast of Neu Pommern and that is irregular.

Cape Tawui (Stephens) is the northern extremity of Neu Pommern, and is the termination of a low spur of the coast range of hills, within which are several craters. A reef fringes it and the coast on either side to the distance of about 100 yards.

From Cape Tawui the coast of Neu Pommern takes a south-southeasterly trend for about 8 miles to Praed Point, having some slight

indentations, whence it turns sharply around to the westward, forming Blanche Bay.

Volcanoes.—Mount Towanumbatir (North Daughter), Mount Kombiu (Mother), and Mount Turanguna, on the Crater Peninsula, are of the respective heights of 1,768, 2,247, and 1,621 feet above high water. Mount Kombiu and Mount Tauruvur are much alike in shape, close together, and evidently extinct volcanoes; Mount Towanumbatir is more distant from Mount Kombiu, and takes a blunter shape. All are richly covered with tropical vegetation. To the westward of Mount Tauruvur is Ghaie, an active volcano.

Directions.—Sailing vessels proceeding eastward in the southeast monsoon period should work up close along the coast between Cape Tawui and Praed Point, thereby avoiding the strong current setting to the westward in midchannel and taking advantage of an eddy current inshore. If intending to visit the Neu Lauenburg Group, it is advisable to stretch across toward Raluana Point and continue along the coast of Neu Pommern before standing over, as the northerly current is generally strong between Credner Islands and Praed Point.

Blanche Bay, on the northeast side of Gazelle Peninsula, westward of the mountains above mentioned, is about 6 miles in length in a northwest and southeast direction by $2\frac{1}{2}$ miles in breadth at the entrance between Praed and Raluana Points. Matupi and Simpson Harbors, on the northern side of the bay, afford excellent anchorage for all classes of vessels.

The shore of Karavia Bay, on the southern side of Blanche Bay, consists of a uniform range of hills rising steeply from the beach to a height of about 2,000 feet above high water, and covered with wood, except where cleared for cultivation. The beach is densely fringed with coconut trees. There is deep water within 200 yards of this shore, so that it affords no anchorage.

On the northern shore the scenery is more striking, as it is overlooked by the three magnificent cones before mentioned, with the rugged outline of two smaller volcanoes in the foreground; Ghaie, the one within Sulphur Point, being active, as before mentioned.

Shoals.—A patch with $3\frac{1}{4}$ fathoms water, over coral bottom, lies 700 yards southward of the point separating Escape Bay from Albino Bay; and another, with a depth of $1\frac{1}{4}$ fathoms over it, lies 300 yards off the western shore of Escape Bay, eastward of Sulphur Point.

The natives of Blanche Bay appear to be similar in race to those of Neu Hannover and Neu Mecklenburg. Much attention is paid by them to cultivation, and owing to the efforts of the missionaries and to the increase of trade they are becoming fairly civilized.

Missions.—There are several villages on the southern shore with Wesleyan mission stations in most of them.

Matupi (Greet) Harbor (lat. $4^{\circ} 14' S.$, long. $152^{\circ} 12' E.$) lies between Sulphur and Bridges Point, $1\frac{1}{2}$ miles apart. Matupi Island, in the entrance and about 40 feet high, is connected with Bridges Point by shallow water and a trestle bridge under which boats can pass. Telephonic communication is to be established.

Between Matupi Island and Sulphur Point the main entrance is nearly 1,600 yards wide, the western half of which is obstructed by the spit which extends 500 yards from the southeast side of Matupi, with patches of $2\frac{3}{4}$ and 3 fathoms 300 yards beyond it. In the fairway the depths are from 17 to 30 fathoms, deepening within.

Beacons.—The extreme of the spit extending eastward from Matupi Island is marked by a tripod beacon painted white.

Two leading beacons stand on the shore of the north part of the harbor.

The front beacon is a pyramidal framework surmounted by a triangle, apex up, and painted white; the rear beacon, which is similar, except that the triangle surmounting it has its apex down, is situated 344° , distant 340 yards from the front beacon, and these beacons in line lead into the harbor.

Small white beacons for adjusting compasses have been erected east and west of the south leading beacon and on the southwestern point of Matupi Island. There is a flagstaff on the east side of Matupi Island.

Buoy.—A black conical buoy is moored in 5 fathoms on the east side of the shoal in the entrance to Matupi Harbor.

Settlements.—Matupi is one of the most important trading places in Neu Pommern. At Rolavio, on the northeast side of the island, is established the German trading firm of HERNSHEIM & CO.; and there is a Wesleyan mission station at the northeast extreme of the island. Herbertshöhe is to the southeastward on the main island.

Communication.—Before the European war the North German Lloyd steamers called every six weeks and there was communication with Sydney by steam and sailing trading vessels, which ran frequently between Matupi and Cooktown.

Coal and supplies.—About 1,000 tons of Australian or New Zealand coal are kept in stock. There are two coal sheds and a coal hulk moored off the island. Coaling is at the rate of about 150 tons in 24 hours.

Fresh meat may be obtained if ordered, but vegetables are scarce. Supplies of yams, sweet potatoes, taro, and a few fowls and pigs may be procured from the natives, also quantities of eggs of the malou or bush turkey. Fish are plentiful.

Water is scarce, and none could be obtained on the north side of Blanche Bay except by digging in the sand, and when thus obtained it was of inferior quality. On the west and south sides of the bay it may be obtained, but not in any considerable quantity.

At the anchorage north of Volcano Island water may be procured from a running stream situated just to the southward of the anchorage; and on the southern side of the bay, about 2 miles southwestward of Raluana Point, are some water holes. These streams, however, being small, vessels generally prefer crossing to Makada Harbor, New Lauenburg Group, to replenish their stock.

Slip.—There is a slip capable of taking small craft of from 60 to 70 tons, and a small machine shop.

Observation spot (lat. $4^{\circ} 14' 12''$ S., long. $152^{\circ} 11' 35''$ E.).—The observation spot is at the northern end of Matupi Island.

Anchorage.—Good anchorage may be obtained off the northeast side of Matupi Island, in about 10 fathoms, with the Dawapir (Beehive) Rocks just open of the north point of Matupi, bearing about 268° and the pillar on the east extreme of Matupi 168° . A large vessel might anchor 200 yards farther eastward.

Directions.—Approaching Matupi Harbor from the eastward, steer in with Dawapir (Beehive) Rocks in Simpson Harbor in line with the south end of Matupi Island, bearing 299° , until the beacons at head of the harbor are in line, bearing 344° , alter course for them, and when Dawapir Rocks are seen just open of the north point of Matupi steer for them and anchor, as before directed.

Tides.—It is high water, full and change, in Matupi Harbor at 9h.; springs rise $2\frac{1}{2}$ feet, neaps $1\frac{1}{2}$ feet.

Seismic wave.—On March 13, 1888, Matupi Harbor was visited by a seismic wave, reports of which have been received from other parts of the coast of Neu Pommern as well as from the northeast coast of New Guinea. At Matupi Island the sea receded, at times, from 12 to 15 feet below the lowest water mark, and then rose in several waves to the same height above high-water mark; but this phenomenon was chiefly confined to the north and southeast sides of the island. The waves came partly from the south and partly from 299° . No indications of earthquake were noticed. The weather at the time was clear, with a gentle southeast breeze.

Simpson Harbor, the head of Blanche Bay, is $1\frac{1}{2}$ miles wide in the entrance, abreast Bridges Point, by 2 miles in length. It affords good anchorage for a large number of vessels, sheltered from all winds, in depths of from 10 to 25 fathoms, over black sand.

About 1 mile north of Bridges Point is a hot salt-water creek, with Rabaul village on its northern side. Anywhere between the point and creek there is good anchorage, in a depth of 10 fathoms, over mud, about $\frac{1}{4}$ mile from the shore.

Dawapir Rocks, in the fairway, form a slight additional protection to Simpson Harbor. The best entrance lies to the westward of them, as the channel on the eastern side has a patch with 1 fathom water over it at 200 yards eastward of the easternmost rock.

The whole length of the passage to Simpson Harbor through Blanche Bay is broad, deep, and clear, and any sailing vessel could work in and out with safety.

The seat of government has been transferred from Herbertshohe to Rabaul, in this harbor.

The governor's house is a conspicuous low white house with red roof and flagstaff, situated on the crest of the ridge extending north-westward from Mount Kombin. The other Government officials reside at Rabaul.

Landmarks.—The pier at the head of the harbor and a large shed with corrugated-iron roof situated northward of it, also the flagstaff and office, with red roof, of the Nord Deutscher Lloyd Co. at Rabaul, are conspicuous objects.

Rabaul.—This settlement consists of 30 or 40 houses.

Port of entry.—Rabaul is the port of entry for Neu Pommern.

Piers.—The Nord Deutscher Lloyd pier is 900 feet long and 63 feet broad. The berthing space is 430 feet long, with a depth of 39 feet at the outer extremity and 24 feet at the inner end.

At Malagunan, on the west side of the harbor, there is a pier belonging to the Hamburg South Sea Joint Stock Co., at which there is sufficient water for large vessels to lie.

Coal.—A coal hulk is moored close southward of the pier, but the main depot is situated on Matupi Island.

There is also a stock of coal at Malagunan, west side of the harbor.

Water can be had at the North German Lloyd pier, along which pipes are laid.

Dawapir (Beehive) Rocks (lat. $4^{\circ} 14' S.$, long. $152^{\circ} 11' E.$) are two remarkable sandstone rocks, in the middle of the entrance to Simpson Harbor, westward of Bridges Point. They stand on the southeastern part of a reef about 300 yards in extent and steep-to. These rocks are each about 100 yards in length and the northernmost is 230 feet above high water.

On the small ledge which surrounds these rocks is a village containing about 200 inhabitants, who support themselves by fishing. The patch eastward of the rocks is mentioned above.

Lightbuoy.—The shoal of 1 fathom, situated 200 yards eastward of these rocks, is marked by a lightbuoy showing a flashing white light every second.

Anchorage.—The prolongation line of the Lloyd pier (about east and west) forms the boundary between the anchorages for warships

and commercial vessels. That for warships lies to the south and that for commercial vessels to the north of the pier.

Anchorage is forbidden in front of the Lloyd pier at a distance of less than 437 yards, with the pierhead bearing between 49° , through east, and 117° . The space inside the depth of 8 fathoms is reserved from vessels.

Volcano Island, on the western side of Blanche Bay, is nearly 600 yards from the main island, with the space between completely blocked with sunken rocks. The island is 1 mile in length by 100 to 1,000 yards in breadth, and rose to its present height of 60 feet above high water at the time of the volcanic eruption and seismic wave in February, 1878. There is a lagoon, with hot sulphureous water, on its southeastern side.

Anchorage.—There is anchorage northward of Volcano Island, in from 5 to 10 fathoms water, about $\frac{1}{2}$ mile northwestward of the northeast extreme.

Climate.—The lowland at the head of Simpson Harbor makes that part very unhealthful, and malarial fever is prevalent.

Raluana or Schulze Point, the southern entrance to Blanche Bay, has reef extending to the distance of 400 yards northeastward of it. There are several mission stations on this shore.

Anchorage.—Temporary anchorage may be obtained westward of Raluana Point Reef, which affords some protection from the easterly swell, in depths of from 10 to 14 fathoms, over sand and coral.

Coast.—From Raluana Point the coast trends southeastward to Cape Gazelle, the northeast extreme of Gazelle Peninsula, with Herbertshohe between. It is fronted by a reef to the distance of from 200 to 400 yards in places, with deep water beyond.

Herbertshohe (lat. $4^{\circ} 20' S.$, long. $152^{\circ} 16' E.$), situated about 4 miles southeastward of Raluana Point, is a small settlement among large coconut estates, belonging to several trading firms. It has a cathedral and large mission establishments. There are stores, and the firms have small machine shops.

The administrator's house is on the hill, 256 feet above high water, at the back. The blocks of houses on the beach are named Kokopo and Bitaboren. At the latter is the hospital.

Herbertshohe is one of the principal depots of the German New Guinea Co., and cotton and coconut plantations are being developed. Owing to its open roadstead, it is considered to be more healthful than Matupi.

Shallow water fronts the settlement to the distance of $\frac{1}{4}$ mile. At the point close southeastward a reef extends off to the distance of 200 yards, while to the northwestward a reef, connected with the shore by a sand spit, extends $\frac{1}{4}$ mile off.

Lights.—A fixed green light is exhibited from an iron beacon erected on the extreme of the reef close to the northwestward of the anchorage.

A fixed red light is shown from a front leading beacon, situated about 100 yards from the shore, about midway between Kokopo and Bitaboren.

A fixed white light is shown from the rear leading beacon, which is near the superintendent's house, and should be visible 7 miles. This beacon is surmounted by a topmark in the shape of an hour-glass, and painted white.

The lights from the leading beacons in line, bearing 205° , lead to the anchorage.

Communication.—Before the European war a mail steamer called at fixed periods.

Pier.—There is a small pier on the beach at Kokopo, with a train-way leading close to it, also several good boat jetties.

Supplies.—Vegetables can always be obtained, and a plentiful supply of good water can be procured from Matanatua, a small stream situated to the eastward of the Roman Catholic mission station.

Anchorage—Directions.—There is anchorage on the sand ridge, about 200 yards wide, extending nearly $\frac{1}{2}$ mile north-northeastward of the front beacon, with a depth of about 10 fathoms on it and deep water on either side. It should be approached with the beacons in line by day, or lights by night, bearing 205° , anchoring when Raluna Point is in line with the light beacon on the northwest reef bearing 306° .

During the westerly monsoon trading craft get as far in under the northern reef as practicable, for the purpose of making it easier for the loaded boats to reach them from the shore. The houses of the administration, on the hill 256 feet above high water, are a good landmark, being visible about 20 miles in clear weather.

Tide.—It is high water, full and change, at Herbertshohe at 9h.; springs rise 3 feet.

Winds—Climate.—From mid-April to the end of September the southeast trade prevails; from the end of September to mid-November, calms; from mid-November to mid-February is the northwest monsoon period; and from mid-February to mid-April calms precede the setting in of the trade wind.

The southeast trade season, a period of five months, is the most agreeable. The wind increases during the forenoon and blows with great regularity until one or two hours before sunset when, after an interval of calm, there is usually a land breeze. This season is called the dry season, but in this case it only means that less rain falls during this time than during the northwest season. Dry weather

for two or three weeks is exceptional. The sky, however, is generally very clear and gales are but rare.

The calm seasons are very sultry and oppressive.

The northwest monsoon comes in quietly, but soon develops strength; masses of leaden gray clouds follow each other, almost without intermission, across the sky. Gales, heavy rain squalls, and floods are frequent, but there are also many days of bright sunshine. The nights are rendered pleasant at nearly all seasons by the land breeze.

A hurricane was experienced on this coast from December 7 to 9, 1900, doing considerable damage. The mission yacht was wrecked, the Government pier destroyed, and several lighters and boats were broken up.

Temperature.—The ordinary day temperature ranges from 86° to 91° and the night from 75° to 77°. The maximum temperature is 97°, but it occurs frequently; the minimum for many years is about 62°. Abrupt variations never occur, so that the cause of the somewhat frequent fevers can not be assigned to them.

Cape Gazelle (Birara Point), the northeast extreme of Neu Pommern, is formed by a long spur from Mount Wunakokor (Varzin) of from 150 to 200 feet above high water, terminating abruptly. From Cape Gazelle the coast turns sharply southward for 20 miles to Cape Palliser, a low spur of the coast range.

Namalili (Tomalili) anchorage (lat. 4° 20' S., long. 152° 25' E.), situated about 1 mile southward of Cape Gazelle, is open to easterly and southerly winds. A coral reef with from 3 to 5 fathoms water fronts the shore at the distance of from 400 to 1,000 yards, within which the depths are 20 to 30 fathoms.

Rugen Harbor is situated about 18 miles southward of Cape Gazelle and a little northward of Cape Palliser. The entrance, which is only 100 yards wide and fringed by coast reefs, is open to the eastward and difficult to distinguish. About $\frac{1}{4}$ mile within the entrance the harbor turns sharply to the southward, and throughout the remainder of its length ($\frac{1}{2}$ mile) has a width of 300 yards and depths of from 4 $\frac{1}{2}$ to 7 fathoms, with more water in the entrance. The harbor is well sheltered and affords limited accommodation for small craft. For the shoals, see the plan.

No inhabitants were seen at Rugen.

Wide Bay.—The coast from Cape Palliser trends south-southwestward for a distance of 18 miles to Cape Buller. About 6 miles farther in the same direction a curious archway of rock, named Cape Archway, projects several yards into the sea, forming the northern headland of Wide Bay.

Henry Reid Bay (lat. 5° S., long. 152° E.), at the head of Wide Bay, on the eastern side of the isthmus connecting Gazelle Peninsula

to Neu Pommern, is about 4 miles across between Tongue and Turner Points, somewhat circular in form, and has an average depth of 20 fathoms, shoaling toward the southern shore. The shore is mostly free from reef, the maximum breadth being about 60 yards only.

At the head of the bay, which is low and thickly wooded, are the mouths of two rivers. Powell River, the southern, is 100 yards in width, with depths of from $2\frac{1}{2}$ to 3 fathoms at the entrance, which depths are maintained for a distance of $\frac{1}{2}$ mile, and it was found navigable for a steam launch about 3 miles beyond.

Dangers.—A reef, breaking considerably, was observed in the fairway of the entrance to the bay.

Brown Island lies northward of Turner Point, and a reef is charted southward of the latter.

Anchorage.—There is anchorage, in a depth of 15 fathoms, with Tongue Point bearing 153° and Turner Point 209° , and good landing may be effected on the sandy beach southward of Powell River, with a depth of 2 fathoms close in. Between the mouths of the streams are many snags. The southern shore and also Brown Island were inhabited (1893).

Coast.—Southward of Wide Bay the coast has a southerly direction for 11 miles, and is composed of three rounded points backed by a volcano and a mountain range. The northern point of this stretch of coast, named Cape Orford (North Point), is a high, perpendicular cliff and forms the southern point of Wide Bay. The point 11 miles southward of this is named Cape Orford (South Point), and between it and Cape Kwoy, a distance of 16 miles in a west-southwest direction, the coast is high, steep, and covered with thick forests.

Kwoy Peak, about 7 miles northwestward of Cape Kwoy, is a mountain, remarkable from its isolated position; viewed from seaward it is a regular cone.

Jacquinet Bay (lat. $5^\circ 35'$ S., long. $151^\circ 30'$ E.), westward of Cape Kwoy, is terminated southwestward by Cape Cunningham, a low point overgrown with bushes. The bay is said to be free from dangers and to be very deep.

Anchorage.—The German naval vessel *Möwe* (1896) anchored in 15 fathoms water, with Cape Kwoy bearing 85° and the northern extreme of Cape Cunningham 119° . There is a German observation column within the latter cape.

Coast.—The coast westward of Cape Beechy, which lies about 30 miles southwestward of Cape Cunningham, is formed by deep bays and low points, behind which the land rises to elevations of from 1,300 to 1,900 feet above high water.

Montagu Harbor, between Cape Dampier and Roebuck Point, was named by Dampier in 1699. The eastern point was named Cape Dampier and it is high, steep, and conspicuous.

Roebuck Point is flat, and behind it are some conical mountain peaks. Off the point there is a group of coral islets.

Water and native provisions are obtainable.

Anchorage.—To the westward of Roebuck Point are several islands connected by reefs, and which form, with the mainland, a sheltered anchorage in from 16 to 20 fathoms water. The entrance is between one of these islands, on which is a village, and a headland of the coast.

Westward of this anchorage is a bay, the western headland of which projects southward and has off it a small island. Beyond this is another bay about $2\frac{1}{2}$ miles wide by $1\frac{1}{2}$ miles deep, and having on its western side an indentation forming a sheltered anchorage. Off the western head of this bay is an archipelago of about 30 islets.

No offlying reefs were seen (1887).

South Cape (lat. $6^{\circ} 20' S.$, long. $149^{\circ} 41' E.$) is the southern extreme of Neu Pommern, and the whole south coast eastward of the cape is apparently free from danger beyond the distance of 3 miles.

Ysabel or Isabel Reef is situated about 4 miles eastward of the cape and 2 miles offshore.

Ross Islands, which are low, are charted about 5 miles 265° of South Cape.

Mowe Harbor, a large bay formed by three high islands and a promontory, is situated about 10 miles northwestward of South Cape, and northward of the Ross Islands. It affords sheltered anchorage.

Anchorage.—In the northern part of this bay there is anchorage in from $5\frac{1}{2}$ to 12 fathoms water. The natives were numerous in this locality (1897) and eager to barter.

Dangers.—Inside the islands there are two or three small coral patches, which, however, are easily avoided. A reef with rocks above water lies 600 yards southeastward of the southernmost island, with a passage apparently about 300 yards wide between.

To the northwestward of Mowe Harbor a river from 200 to 300 yards wide flows into the sea and is navigable for a distance of 5 miles, but its entrance is fronted by a shoal having from 5 to 6 feet water over it.

Cape Merkus is charted about 40 miles westward of South Cape, and in this vicinity the water is discolored by a considerable river discharging into the sea between two hills. This river has no bar

at the entrance, and for a distance of 9 miles from its mouth the least water obtained was 16 feet.

The Gracieuse Archipelago, some 15 miles in length, extends about 7 miles off Cape Merkus and the coast northwestward. The navigation is intricate among these islands owing to the numerous coral reefs.

Reefs.—A reef extends about 3 miles west-southwestward from the southwestern island of this archipelago. Two detached reefs are situated northwestward of the western extremity of this reef at distances of about 1 and 2 miles, respectively.

Kilenge is described as situated on the northwest corner of Neu Pommern. The roadstead is full of reefs, which are partly under water and only to be seen when quite clear, so that navigation is very difficult and can only be made during the day.

Coast.—Farther northwestward the coast presents deep bays, with capes of moderate height, having the appearance of islands from a distance.

At the next prominent headland northwestward of Cape Merkus there is a river about 250 yards wide, the waters of which are but slightly discolored.

Cape Busching (lat. $5^{\circ} 53' S.$, long. $148^{\circ} 37' E.$) is charted about 33 miles northwestward of Cape Merkus, and forms the eastern side of approach to Dampier Strait. This strait and the shoals in its southern approach are described elsewhere; see index.

Grass Point, the western extreme of Neu Pommern, is so named from the number of grassy fields in the neighborhood, all the remainder being wooded. It is free from reef beyond the distance of 400 yards, with depths of from 8 to 16 fathoms at about $\frac{1}{2}$ mile offshore. There is a stream about 4 miles northward of it.

Lagoon Point, about 6 miles farther northward, has a reef extending $\frac{1}{4}$ mile off it. Beyond is a lagoon within the reef navigable by boats.

Anchorage.—There is anchorage off both the points mentioned in from 6 to 8 fathoms water. There are villages hereabout.

Cape Gloucester, 100 feet above high water and covered with trees, is the northern extreme of the western end of Neu Pommern. A barrier reef is charted from 1 to 3 miles off the coast westward of it, and the coast reef ends here.

North coast.—The north coast of Neu Pommern is but little known. Between Cape Gloucester and Cape Hollman, the northern extreme of Willaumez Peninsula, reefs are charted some 10 miles offshore. There are several villages in the neighborhood of Cape Gauffre, about 15 miles east-southeastward of Cape Gloucester.

Caution.—Numerous outlying reefs have been discovered off the coasts of Neu Pommern, and the chart should not be implicitly relied

on as a safe guide for navigation. The chart hardly gives any help as far as the Willaumez Peninsula; all the names and enterings are wrong.

Komethafen.—This harbor lies near Talangone Island (not shown on chart), which is, as well as the surrounding islands and the mainland, well populated. A good anchorage, protected against northwest winds, is to be found near the island. A passage was found from the north, leading through reefs that are not easily seen. Farther east, along the coast of the Willaumez Peninsula, the passage is very difficult and blocked by numerous reefs.

Willaumez Peninsula.—A mountainous peninsula projects for a distance of about 30 miles in a north-northeasterly direction from the north coast of Neu Pommern, and was at one time supposed to be formed of Willaumez, Raoul, Du Faure, and other islands.

The western coast of the peninsula is fronted at intervals by detached reefs, the outermost lying 6 miles west-southwestward from Cape Schellong, and the remainder nearer the shore. Mount Bola, 3,819 feet high, rises about 2 miles eastward of Cape Goltz.

At Cape Hollman, the northern extreme of the peninsula, a reef extends $1\frac{1}{2}$ miles from the shore, and Cape Heusner, the northeastern extreme, is surrounded by an extensive reef 2 miles wide, on the south part of which are some rocky islets. Immediately eastward of the southern portion of the peninsula is Stettin Bay, with deep water, and in which are several reefs toward the head and on the east side.

Reef.—About 10 miles east-southeastward of Cape Heusner is a coral reef about 200 yards in extent with about $1\frac{1}{2}$ fathoms water over it.

Two detached reefs extend 4 miles north-northeastward, and one other lies 3 miles southwestward from the $1\frac{1}{2}$ -fathom reef.

Hannam Harbor, nearly 20 miles south-southwestward of Cape Campbell, is a well-sheltered harbor, but the anchorage in depths of from 20 to 25 fathoms southward of Observation Island is bad, being over rocky bottom.

A reef is situated in the northern approach to this harbor in latitude $5^{\circ} 10' S.$, longitude $150^{\circ} 09' E.$

Several reefs lie eastward of the entrance to Hannam Harbor at $2\frac{1}{2}$ miles from shore.

Hannam Harbor is also known as Garua Harbor.

A small reef with very little water over it lies 78° , distant $\frac{3}{4}$ mile from Observation Island. Owing to its light color it is easily seen in a favorable light.

MacCulloch Point (lat. $5^{\circ} 26' S.$, long. $150^{\circ} 28' E.$) is the eastern extreme of Stettin Bay. Between it and Fritz Island (Kimba), 100

feet above high water, charted about 14 miles to the northward, there are several detached reefs.

Southward of the point is Two Peak Mountain, 2,000 feet above high water.

Cape Hoskins, about 8 miles eastward of MacCulloch Point, is a bold point fronted by reef and backed by high mountains. Mount Pyramid, about 12 miles south-southeastward of Cape Hoskins, is 2,090 feet above high water and takes its name from its shape.

Commodore Bay, southeastward of Cape Hoskins, is encumbered with reefs.

Wulai (Jenkins) Island, lying about 8 miles northwestward of Cape Hoskins, is about 3 miles in length, with reefs extending for about 3 miles from its extremes. Between Wulai Island and the mainland discolored water was seen.

On its east side is a harbor, well protected by a reef. The eastern entrance is marked by two leading beacons, each with top mark of two white triangles, points toward each other.

May Reef lies about 7 miles northward of Wulai Island.

Fairway Reef, about 3 miles in length in an east-and-west direction, is 35 miles 43° from Cape Hoskins and 12 miles from Cape Koas, the nearest land. There are two submerged sand banks.

MacDonald and Vesey Islands lie to the eastward of Commodore Bay. The former is low and thickly wooded.

Chard Island, lying to the eastward of Vesey Island, is about 5 miles in length and about 100 feet above high water.

Mountains.—The Ulawun (Father) Mountain, 7,546 feet above high water, is situated about 5 miles from the shore, southeastward of Loloban Island, Bamus (South Son) 3,035 feet, and an active volcano being about 12 miles to the southward of it. Likuruanga (North Son), 3,248 feet above high water, is near the coast, about 10 miles eastward of Lolobau Island, and from the offing appears as an island, the land between it and Ulawun being very low.

Coast.—A low point stretches northwestward from the base of Ulawun Mountain and $7\frac{1}{2}$ miles northeastward of it is Cape Torkoro (Deschamps), which is steep-to, with high cliffs. Close to the northeastward of the cape is Kakolan (Heath) Island, steep-to all round and 197 feet above high water.

Lolobau Reef is charted 12 miles 336° from Fairway Reef, but is reported to lie $6\frac{1}{2}$ miles farther south, which places it close to the position of the southwestern extreme of Banban Reef, about which there is no information. Between Banban Reef (as charted) and Banban Island are many isolated reefs.

Lolobau (Duportail) Islands lies about $3\frac{1}{2}$ miles off the coast northwestward of Ulawun Mountain, with Erwartungs (Expectation) Strait between. The largest island is 3,058 feet above high

water, about $7\frac{1}{2}$ miles in length, and $4\frac{1}{2}$ miles in breadth. Tiwongo (Close) Islet lies $\frac{1}{2}$ mile off the southeast side of Lolobau and has a narrow reef extending nearly $\frac{3}{4}$ mile southward from it. There is anchorage on the west side of Tiwongo in 9 fathoms or more. Banbane and Muli, two smaller islands, 689 and 262 feet above high water, respectively, are about 4 miles westward of it. Sunken rocks are charted northward and eastward of these islands. Near the southwest end of Lolobau Island is an active volcano and at the northeast end is a conical peak.

Reefs.—**Passage Reef** lies $1\frac{1}{4}$ miles 203° from Tiwongo Island and nearly in the middle of Erwartungs Strait. Reefs lie offshore westward of the south point of Lolobau Island for a distance of about 2 miles, the outermost being 1.3 miles from the land.

Two reefs lie 4 and $4\frac{1}{2}$ miles, respectively, 171° from the western extreme of Lolobau. A reef lies $\frac{3}{4}$ mile southward of Muli, and a group of reefs, 2 miles in length east and west, lies from 1 to 2 miles northward of that island. A shoal of $1\frac{1}{4}$ fathoms lies about 4 miles 93° from the eastern extreme of Lolobau (a red cliff), and a reef lies 2 miles 68° from the same point.

From $4\frac{1}{2}$ to $8\frac{1}{2}$ miles in a northeasterly direction from the east end of Lolobau is a group of shoals about 2 miles in width, with from $1\frac{1}{4}$ to $3\frac{1}{4}$ fathoms on them. About midway between this group and Cape Torkoro are two patches of $1\frac{1}{2}$ and 2 fathoms, respectively, $1\frac{1}{4}$ miles apart in a 31° and opposite direction, with deep water around.

Sand bank.—At about 8 miles 23° from the northeast end of Kakolan is a sand bank, with deep water around.

Hixon Bay, about 9 miles eastward of Cape Torkoro, is shallow, about 4.3 miles wide and $1\frac{1}{4}$ miles deep, and open to the northward. The coast is low and rises gradually from the shore, Ulawun and the other mountains above mentioned standing in the background on comparatively low ground. There is good anchorage in this bay during the southeast monsoon, but no shelter from the northward.

The Langalanga River empties itself into the middle of the bay, and can be entered by a steamboat at low water. Several smaller streams lead into this river, the banks of which are mostly swampy and overgrown with sago palms. There is a village near the mouth and many native tracks were seen by the officers of the German naval vessel *Möwe*, who surveyed the northwest coast of Neu Pomern in 1902.

A little over $1\frac{1}{2}$ miles from the Langalanga is Baandi River, the mouth of which is so blocked by banks that it was only passable in small boats. It has, like the Langalanga, many small tributaries. No signs of natives were seen on this river.

The point between Open and Hixon Bays is rocky, and reefs extend off it in places.

A reef with $4\frac{1}{2}$ feet least water, and 400 by 300 yards in extent, lies 2.7 miles 313° from the east entrance point of the bay.

Korleili Reef, which dries, lies $\frac{3}{4}$ mile north of the point between Hixon and Open Bays. At about $\frac{3}{4}$ mile westward of Korleili Reef is another that dries, lying 1 mile from the shore.

Rangambol Point (lat. $4^\circ 55'$ S., long. $151^\circ 32'$ E.) is to the eastward of the above point, and to the southward of it is a good anchorage for a moderate-sized vessel. Between the coast and barrier reef it is sheltered from all winds, the entrance between the reefs being clear and the anchorage ground 750 yards wide.

Open Bay.—For $3\frac{3}{4}$ miles from Rangambol Point the coast trends to the southeastward to the bottom of Open Bay. From here it turns to the eastward and northeastward for $8\frac{3}{4}$ miles, and then nearly due north for 4 miles to Tawanatangir. In the southeast part of the bay are two streams, the Korindindi and the Nessai, 2.2 miles apart. The latter has a native village at its mouth and plantations of taro and sugar cane along its banks.

Near the point where the coast turns northward is a large flat grass plain which is very conspicuous against the surrounding brushwood. This district is called Matanakunai.

Natives.—The natives in Open and Hixon Bays were found to be shy but friendly in their manner, and are taller and better grown than the natives of the Gazelle Peninsula. Their dress is different, and in their hair they arrange lumps of red ocher instead of using lime, which turns the hair to a whitish yellow color.

Tawanatangir (Port Powell) is a basin about 700 yards across, with good anchorage but a narrow and ill-defined entrance. Outside it is a protected harbor, formed between the mainland and reefs, in which is Turtle Island. It is small, but its shore, with a conspicuous white sandy beach forms a good landmark for the port.

At the northern corner of Tawanatangir a stream flows in through swamps, but its water is unfit for drinking.

Coast.—The coast from Tawanatangir to Mulua Point is overgrown with brushwood and has a level, sandy shore, and from the latter point its direction is northward for a distance of $9\frac{1}{2}$ miles to the river or lagoon entrance of Marawo. In this stretch of coast there are three large streams, viz:

Toriu or Holmes River (lat. $4^\circ 43'$ S., long. $151^\circ 40'$ E.), which is the largest on this coast, and has, about 2 miles from its mouth, the sawmill of the Roman Catholic Mission Society.

Wunangamata River is wide, but its water is muddy and stinking and its banks are swampy.

Sambai River, about $\frac{3}{4}$ mile northward of the Wunangamata River, has but little stream, and can be navigated by boats for some distance.

Coast.—Near the Marawo entrance the coast turns to the westward for a short distance to Wunambere Cape, from whence it has a north-northwest direction to Cape Pondó, which projects $\frac{1}{2}$ mile to the west-southwestward.

Just eastward of Cape Pondo a small stream, from a lagoon inland, flows out, and there is a settlement where a white trader resides.

The shore from Cape Pondo to Rangombol Peninsula is flat and sandy, but from there to Matiu Point the coast is swampy and covered with mangroves through which flow several small streams, the water from some of which, as also from Malaulau, a large waterfall in this vicinity, is drinkable. The general direction of the coast is to the northwestward.

Misemisagoro, a small rocky island about 1,800 yards from Matiu Point, is uninhabited, but passing natives often pass the night there.

Matiu Point is covered with mangroves and fronted with broad reefs, and from here the coast trends to the northward until nearly $1\frac{1}{4}$ miles from Rarakarakau Point, when it turns to the westward. It then bends to the northward again for 2.6 miles to Tavanamapinai Cape, and for half that distance is covered with high trees to Tongalienakanai River, which is navigable by boats for over a mile. Between the river and Tavanamapinai Cape there is a sandy beach.

From this cape to Cape Kaponosarere the coast has a general northwesterly direction, forming a shallow bay scarcely noticeable from seaward. Two small streams flow into this bay, which is thickly fringed with mangroves and fronted with reef extending from 600 to 700 yards from the shore. Several large reefs lie off this part of the coast at a distance of about $\frac{3}{4}$ mile, and there is sheltered anchorage between them and the shore reef in a depth of 27 fathoms.

Caution.—Water in most of the rivers on this part of the coast is unfit for drinking, and as crocodiles of all sizes abound in them bathing is dangerous.

Coast—Reefs.—From reports from the German naval vessel *Möwe* it would appear that the coast from about Hixon Bay to Cape Lambert is all to the westward of the charted position from 5 to 10 miles. The *Möwe* passed close to a sand bank which was placed in latitude $4^{\circ} 45' S.$ and longitude $151^{\circ} 29' E.$

ISLANDS BETWEEN NEW POMMERN AND THE ADMIRALTY ISLANDS.

Merite Island (lat. $4^{\circ} 57' S.$, long. $149^{\circ} 08' E.$, situated about 50 miles westward of the northern extreme of Willaumez Peninsula, is about 5 miles in length in an east and west direction by 4 miles in

breadth. The summit, dome shaped and 1,936 feet above high water, is nearly in the center of the island, two other peaks of nearly the same height being near the eastern end.

The western part of the island is about 800 feet above high water, grassy and undulating. The island is fairly clear of reefs on its northern side, but some rocks and islets are situated off the southern point, and an islet, 160 feet above high water, off the northeast side, close to the shore. Merite Island is apparently inhabited, and the position given is that of its northern point as determined by the German naval vessel *Möwe*.

On the eastern side, to the northward of the islet, there is a semi-circular barrier reef, through which two deep and broad passes lead to an open space of water inside. These reefs and passes are easily distinguished.

French Islands, the largest about 20 miles northeastward of Merite Island, consist of one large island, about 7 miles in length, and four smaller ones, all covered with vegetation. These islands are reported to lie more to the southwestward than charted. A chain of hills, about 300 feet in height, extends through the largest island, with deep valleys in places, giving it the appearance of a number of islands from a distance. On it there is a trading station and an abundance of coconut trees. Vingoru, Vambi, and Undanga lie westward of it. The sand bank charted farther west breaks at times.

Shoal water is charted as extending about 5 miles off the northwest coast of the largest islet, but this was not seen when the islands were visited by the German naval vessel *Möwe*.

Deslacs Island is mountainous and densely wooded, the highest point being about 984 feet above high water. It is surrounded by reefs, extending but a short distance on the northern side and from 2 to 3 miles from the southeast point.

Peterhaven, on the eastern side, is an excellent harbor, and there is said to be a small boat harbor on the western side. There is a resident trader of the New Guinea Co. at Peterhaven.

Peterhaven is formed by a sunken crater, the highest part of the wall of which is 368 feet above high water. A low and heavily timbered tongue of land forms the eastern side of the harbor, leaving an entrance 270 yards wide. To the eastward of this entrance are several large coral reefs in a semicircular group, forming an outer harbor. Through these reefs are three passages, the center one of which is practicable for large vessels, the other two being very narrow and nearly 200 yards in width, with depths of 16 to 30 fathoms.

Position (lat. $4^{\circ} 39' 25''$ S., long. $149^{\circ} 31' 18''$ E.).—An observation column, erected by the *Möwe* for the survey, is situated on the southern summit of the low tongue on the eastern side of the harbor.

Beacons.—Near the column is a beacon with a triangular top-

mark, which, in line with a beacon with an "hourglass" topmark on the western side of the harbor, bearing 271°, leads through the main entrance.

The southern edge of the northern entrance reef and the north-western edge of the southern entrance reef are marked by pole beacons.

Anchorage.—In the outer harbor the anchorage is in from 10 to 20 fathoms water, and in the inner harbor, in which there is swinging room for one vessel or for two or three moored, there are depths of from 13 to 16 fathoms. The bottom is fairly even, rising steeply to the shore and reefs.

The best anchorage in the inner harbor is midway between the observation column and the western beacon, in 16 fathoms water, over mud and sand.

Directions.—The harbor will be recognized by the houses of the trading station, which is on the low tongue of land. The beacons are visible for a distance of 5 miles. The beacons in line, bearing 269°, lead nearly in mid-channel between the outer reefs, but a reef extending some distance to the northward from the southern entrance point of the inner harbor must be avoided.

Johann Albrecht Harbor, on the southern side of Deslacs Island, is a large crater with a sunken lip to the southward. It is reported that the water is too deep for anchoring and that it is in consequence of no use as a port.

Reefs.—From the German naval vessel *Cormoran* it is reported that there are many reefs among the islands of the French Group.

Gipps (North or Narraga) Island, about 12 miles west-northwestward of Undanga Island of the French Group, is a round, sugar-loaf-shaped island, 1,033 feet above high water, about 3 miles in circumference, and surrounded by a reef which, on the eastern side, extends a considerable distance, forming a harbor for small craft, the entrance being from the north. The island, which is thickly populated, has a boiling spring on a sandy beach on the southeastern side, and also one on the southwestern side, which threw up water at times to a height of 20 feet.

Rocks.—The following reefs and rocks exist in the neighborhood of Gipps Island:

A reef, which breaks, about $3\frac{1}{2}$ miles in length, at about 1.3 miles northward from the island.

A reef, which breaks, at about 1,800 yards, west-northwestward from the island.

A rock with a depth of 3 fathoms at about 1.2 miles southwestward from the island.

A chain of reefs, extending for about 5 miles in a southwesterly direction, at about 3 miles southwestward from the island.

Two rocks with depths of 3 fathoms at about 1,600 yards south-eastward of the island.

Ottilien Reef lies 19 miles 269° from Gipps Island. It is an atoll formed by a group of four reefs, of which the western is always uncovered and marked by heavy surf. A sand cay is situated on the eastern end of the reef. There are entrances from northward and southward. The reef extends about 3 miles east and west and about 2 miles north and south.

Whirlwind Reef (lat. $4^{\circ} 40' S.$, long. $148^{\circ} 17' E.$), upon which rocks, above water, and breakers were seen, is said to lie with Lottin Island bearing 228° , Cape Gloucester 171° , and Merite Island 107° . The German steamer *Ysabel* (1888) reported this reef to be several miles to the northward of the charted position.

These reefs are two in number, the northern of which is circular and about $\frac{1}{2}$ mile in diameter.

The southern reef is of horseshoe form and 3 feet high.

Numerous rocks extend northward, southward, and eastward of these reefs.

The position of Whirlwind Reefs is considered doubtful.

Beacon.—An iron beacon, 24 feet in height, with hourglass-shaped topmark, has been erected on the northern end of the southern reef.

Victoria Reef is charted 340° , distant 24 miles from Whirlwind Reef.

Albert Reef is charted 328° , distant 22 miles from Victoria Reef. Both these reefs break at times.

Doppel Reef (Sherburne Shoal) (lat. $3^{\circ} 19' S.$, long. $148^{\circ} 0' E.$), discovered by the *Sherburne* in 1824, extends for $4\frac{1}{2}$ miles in a north-and-south direction and is about $2\frac{1}{2}$ miles wide. It consists of two parts, the northern of which is the larger and nearly dries.

The south reef has a passage on the west side, 600 yards wide, with deep water, and a boat passage on the east side. In the interior lie small isolated patches.

The north reef has a passage on the west side, 200 yards wide, with deep water. There is anchorage in the interior, which is free from patches of reef.

Circular (Kreis) Reef is 12 miles west-southwestward from Doppel Reef. It nearly dries, and is about 6 miles in length in a northwest and southeast direction. A tree trunk on its northern end has the appearance of a rock.

On the south side there is a passage 600 yards wide. In the interior there is good anchorage, but there are several patches of reef, which show well in a good light.

Sydney Shoal, about 55 miles westward of Circular Reef, on which the *Sydney* was wrecked in 1806, is covered at high water, but at low water some rocks appear above the surface.

The islands and reefs to the northward are described with the Admiralty Islands.

ADMIRALTY ISLANDS AND OFF-LYING ISLETS AND REEFS.

General remarks.—The Admiralty Group consists of one large island and numerous smaller ones. The largest, known as Admiralty Island, is about 50 miles in length, attaining near the central part an elevation of 3,000 feet above high water.

Of the other islands, *Jesu Maria*, lying to the southeastward of Admiralty Island, is the largest.

This group is still but imperfectly known and the vicinity should be navigated with much caution. It was discovered by *La Maire* and *Schouten* in 1816, but the following remarks are principally derived from the visits of British naval vessels. A Queensland pearling company operates among the group and have a large fleet of small craft employed.

Mission.—There is a Roman Catholic mission.

Natives.—The inhabitants of the Admiralty Islands appear to be much more friendly now than they were formerly, although they are still reported as being treacherous.

During the *Challenger's* visit (1875), however, they were civil and well disposed. They offered no objection to landing or exploring on any of the islands, and although at first they showed some antipathy to visiting their villages, when they found no attempt to force an entrance into their houses nor to go near those places to which they appeared unwilling to allow a visit, they relaxed their distrust, and the *Challenger's* people were free to go in and out of the villages as suited them.

The only weapons they appear to possess consist of a spear and knife, both of which are made of obsidian, and they readily exchange them for useful articles. Fighting is probably rare among them, as none of them had scars, and, with the exception of the light stockade around the village at *D'Entrecasteaux* Island, their houses were open and unguarded.

Their persons are ornamented with armlets of shells and beads and necklaces of teeth, and in some instances they are tattooed. In one or two cases some human bones were noticed hung by a string around their necks.

Their principal food appears to be sago, and there is a species of breadfruit tree on the islands; they have also plantains and coconut

trees. The only animals in their possession at the time of the *Challenger's* visit were dogs and pigs, and of these only a few. One male and four female goats were landed on Suhm Island.

The canoes used at this group are large and capable of containing a considerable number of men. They are about 40 to 50 feet in length, quite narrow, and hewn out of a single log. They have an outrigger on one side and are provided with sails of matting.

Admiralty Island is about 50 miles in length east and west by about 12 miles in breadth, and attains an elevation of about 3,000 feet above high water near its center. The native name of the island is *Manus*.

Southeast coast—Harbor (lat. $2^{\circ} 06' S.$, long. $147^{\circ} 15' E.$).—This harbor is called Kelaua (more correctly Laues or Loues), and the river of the same name discharges into it. About 3 miles up the river, on the chain of hills bordering it, is the large village of Laues. From the harbor a road leads to the station at Seeadler Harbor and another to the villages inland. The natives here and at several villages on the south coast are partly not easy to be approached.

From the eastern point of the island the coast westward is fringed by a narrow reef to Dorf Village, westward of which is a bay with a reef across its entrance.

Southward of this bay is a harbor with Bird Islet, a moderately high islet, situated on a reef off its northern point.

The entrance to this harbor through the barrier reef is about $\frac{1}{2}$ mile wide, the latter extending in this part about $\frac{1}{2}$ mile from the shore. Outside the entrance, and nearly off the center of it, lies a patch having a clear passage on either side. There are two other patches in the vicinity, one a short distance outside with from 4 to 5 fathoms water over it, and the other about $\frac{3}{4}$ mile to the southeastward of the patch lying off the entrance.

Vessels entering this harbor should do so with the sun astern, or abaft the beam, when the reefs are more easily discerned. The fringing reef of Bird Islet should be kept aboard until the reef in the center of the entrance is made out, the passage northward of which is to be preferred.

Reef.—A reef is reported to exist to the westward of Bird Islet, which must be avoided when entering the harbor.

The anchorage is in the southern part of the harbor, in from 15 to 20 fathoms, where there is room for several vessels. In the southwestern part of the anchorage the fringing reef extends 400 yards from the shore where the mouth of a small river is situated. The German naval vessel *Habicht* anchored in a depth of 17 fathoms, and was sheltered from wind and swell with Bird Islet bearing 89° and the southern entrance point 140° .

The German naval vessel *Condor* (1904) anchored in about 17½ fathoms water with Bird Islet bearing 75° and the southern entrance point 155°.

The anchorage in the northern part of the harbor inside Bird Islet is not recommended, the water being deep, and there is not sufficient swinging room.

Coast.—From abreast Bird Islet the coast trends southwestward, for about 8 miles, to Sanders Point, the southeast extremity of the island, which is fringed by reef. The reef extending southward and westward from Sanders Point is reported to stretch somewhat farther out than charted.

Sanders Point (lat. 2° 13' S., long. 147° 12' E.) is low, and may be recognized by a village built on stakes extending from it into the sea, and by the two Dover Islets lying near each other, about 3 miles southeastward of the point, with a clear passage between.

South coast.—From Sanders Point a deep bay recedes to the northwestward, and from the western entrance point of the bay the coast trends westward 6 miles to Hilly Point.

The fringing reef extends 2 to 3 miles from the shore for a distance of 6 miles to the westward of Sanders Point, with apparently no outlying dangers. Thence to Hilly Point the fringing reef extends but a short distance, but there are outlying reefs.

Hilly Point, low and wooded, is the termination of a range of mountains about 3,000 feet above high water sloping gradually toward the sea, having off it Green Island, sandy, with two hillocks, and covered with a kind of reed grass. The native name of this island is Rubal and in 1874 it was thickly populated.

Inshore passage—Anchorages.—The British naval vessel *Alacrity* (1874) when about 5 miles eastward of Hilly Point found a passage about 2 miles from the shore through the reefs and patches and anchorage was obtained in a depth of 16 fathoms over muddy bottom within 200 yards of the reef which extended about 50 yards from the shore.

For a distance of about 25 miles westward of the anchorage the sea is studded with reefs and shoals extending from 3 to 5 miles from the shore. In proceeding to the westward inside the reefs keep close to the shore until abreast of Hilly Point where there is a clear passage ½ mile wide between Green Island and the islet southward of it; thence for a distance of 7 miles to the westward the shoals are not so numerous. There is a small anchorage close to the shore with Sugar-loaf Island bearing 202° and the extremes of the land 266° and 100°. For a distance of 8 or 9 miles to the westward of this small anchorage there are numerous reefs and patches.

Several bays were observed from the *Alacrity* when passing along this coast with apparently shoals at their entrances.

About 15 miles westward of Hilly Point there are two islets near each other between which and a projecting point, with a small island off it 7 miles to the westward, the navigation is clear. Shoals extend about 2 miles eastward of the island.

Between this island and Southwest Point, about 2 miles to the westward of it, there is a bay in which there are coral patches.

Southwest Point (lat. $2^{\circ} 12' S.$, long. $146^{\circ} 36' E.$) is moderately high and thickly wooded, but the coast near it appeared to be a swamp for about $1\frac{1}{2}$ miles inland.

From Southwest Point the coast trends in a northwest direction for a distance of about 5 miles to Alacrity Point, with fringing reef extending about 2 miles off.

Anchorage.—About $\frac{1}{2}$ mile southward of Alacrity Point there is an anchorage, with the following bearings of the only three islands visible from it, viz, Northern Island, 325° ; Center Island, 314° ; and Southern Island, 278° .

The *Alacrity* passed through an opening in the reef and obtained good anchorage, in a depth of 10 fathoms, about $\frac{1}{2}$ mile within the reef and $\frac{1}{4}$ mile from the shore.

Inside the patches in the entrance there is a small shoal, which is not easily seen, having a depth of about 6 feet over it.

Between Alacrity Point and the three islands (seen from the anchorage) about 8 miles to the northwestward there are several reefs and patches. Between the point situated about 4 miles northward of the anchorage and Wyville Point, the northwest extreme of Admiralty Island, there is a deep bay of which nothing is known.

North Coast.—**Wyville Point**, the northwest extreme of Admiralty Island, is rocky and fringed by a reef to a short distance.

From Wyville Point the land rises in a gradual slope to a saddle hill, 500 feet above high water, $2\frac{1}{2}$ miles southward of the point.

Shallow Bay is 4 miles wide between Wyville Point and Moseley Point to the eastward, and is about 3 miles deep. It has not been sounded, but as the *Challenger's* pinnacle, with an exploring party, grounded several times, vessels should not attempt to make use of it. There are no inhabitants in the locality, nor could any stream of fresh water be found in or near it.

In center of the bay are Higham, Button, and Ferguson Islands, all of which are low, flat, and thickly wooded.

Moseley Point (lat. $1^{\circ} 57' S.$, long. $146^{\circ} 38' E.$) is the eastern extreme of Shallow Bay. Thence the coast trends eastward for nearly 3 miles, following the southern side of Nares Harbor, when it forms a small promontory which has a boat cove on its western side, and Richards Islet eastward of it.

Pigeon Islet lies about a mile eastward of Moseley Point, surrounded by a reef.

The whole of that part of the coast of Admiralty Island which was explored to the eastward of Moseley Point is fringed with a coral reef which extends from 400 to 800 yards from the shore. For off-lying shoals, see Failure Rocks.

Maclear Island, the summit of which is 200 feet above high water, lies about $1\frac{1}{2}$ miles northward of Wyville Point. It is thickly wooded, nearly round in shape, 1,000 yards in length, and is surrounded by a coral reef, on the western edge of which are two rocks about 20 feet above high water, named Twin Rocks.

Buchanan, Moseley, and Murray Islands.—At $5\frac{1}{2}$ miles westward of Wyville Point are Buchanan, Moseley, and Murray Islets, wooded and encircled by a reef which extends some distance from them. Between this reef and D'Entrecasteaux Island there is a wide and apparently deep channel into Nares Harbor.

Carpenter, Browne, and Tracy Islands, low, flat, and thickly wooded, are connected by a reef. They lie in a northwest direction from Moseley Point, between that point and D'Entrecasteaux Island, and form the western side of Nares Harbor. Carpenter and Browne Islands are connected by a tongue of land on which is a trading station, with dwelling and storehouses.

There is a channel 1,600 yards in width between the reef surrounding them and the reef off Moseley Point, which appears, so far as explored, to be safe and deep; and there is probably also deep water between D'Entrecasteaux Island and this reef, as well as between it and Maclear Island, where one sounding of 19 fathoms was obtained.

The space between these three islands and Maclear Island appears an excellent position to anchor in if the water should be found of a suitable depth, but it has not been examined.

Shoal.—A dark coral patch, on which the steamer *Sumatra* struck, is reported to lie with the southeast point of Tracy Island bearing 213° , distant $\frac{1}{2}$ mile, but no depth is given.

Beacons.—The approach to the trading station is marked by the following beacons:

A beacon on the northern side of a detached shoal with 1 fathom water over it and another on the northern edge of the 1-fathom curve northeastward of Carpenter Island. Vessels entering should pass close northwestward of these two beacons.

A beacon on the southwestern edge of the reef which fringes Browne Island and northwestward of the eastern of the two previously mentioned beacons.

Nares Harbor (lat. $1^{\circ} 57' S.$, long. $146^{\circ} 40' E.$), near the western extreme of the north coast of Admiralty Island, is a well-sheltered and convenient anchorage, easy of access, but destitute of supplies. It is nearly 8 miles in length in an east-and-west direction, has an

average breadth of 2 miles, and is protected by a reef which, joining some outlying islands lying nearly parallel to Admiralty Island, forms a natural breakwater completely sheltering the space inclosed between it and the coast of that island. This reef has been named after D'Entrecasteaux, who made a running survey of the northern portion of the Admiralty Group in 1792.

The whole of the space inclosed between D'Entrecasteaux Reef and Admiralty Island is not available for anchorage, part of it being occupied by several small islands and shoals; there is, however, sufficient room to afford shelter to a number of vessels.

Barrier reef.—**D'Entrecasteaux Reef** is 7 miles in length in an east-and-west direction and 1,200 yards in width at its broadest part. On it are three low, flat, sandy islands, named D'Entrecasteaux, Suhm, and Wild, all of which are thickly wooded, two of them, D'Entrecasteaux and Wild Islands, being inhabited. Close to the eastern extremity of the reef is a sand cay with a few trees on it, named Observatory Islet, being the observation spot of the British naval vessel *Challenger* in 1875.

The northern or outside edge of the reef is well defined and has apparently no outlying dangers.

The southern or inner edge of the reef is not well defined. It has, as is usual with coral reefs, several mushroom rocks cropping up close to it with deep water around. At $2\frac{1}{2}$ miles from the western extremity of the reef there is an opening which has not been examined, but the sea breaks at times across it.

D'Entrecasteaux (Harrangun) Island is the westernmost of the three on the reef of that name and lies 600 yards from its western edge. It is nearly $\frac{1}{2}$ mile in length, 400 yards in breadth, and low and flat, but covered with trees, from 80 to 100 feet above high water, visible at some distance.

Natives.—The natives live in a village on its northern side, which is guarded by a rough stockade. The landing is on the southern side. There is no good water to be found here or, in fact, on any of the small outlying islands which were visited. The natives use the sea water, which filters through the sand into wells dug near their habitations.

Suhm Island, lying a little over a mile eastward of D'Entrecasteaux Island, is nearly the same size and height as that island, but was uninhabited.

The space to the westward of Suhm Island appeared from the masthead of the *Challenger*, when outside the reef, to be free from danger and good anchorage will most likely be found there.

The western point of D'Entrecasteaux Reef may probably be rounded at a distance of from $\frac{1}{4}$ to $\frac{1}{2}$ mile and anchorage found between the two islands to the southward of the reef; but it must be

borne in mind in entering the harbor by the western passage that no soundings have as yet been obtained there, and therefore it is imperatively necessary that a good lookout should be kept from aloft for any shoal heads that may exist. See Shoal, preceding page.

Wild Island, lying about $3\frac{1}{2}$ miles east-southeastward of Suhm Island, is $\frac{3}{4}$ mile in length and 250 yards in breadth at its widest part, and, like Suhm and D'Entrecasteaux, is low, flat, and covered with trees. Wild Island is inhabited, the village being on the southern coast, near its center.

On the two inhabited islands there are numerous coconut trees, whereas neither of the other small islands nor the coast of the larger island (Admiralty) in the immediate neighborhood of the harbor have any.

Shoal.—A shoal with a depth of $2\frac{3}{4}$ fathoms and deep water around is reported to exist with the western extreme of this island bearing 345° , distant 1,150 yards.

Observatory Islet (lat. $1^\circ 55' 10''$ S., long. $146^\circ 40' 56''$ E.) is small and stony, with a few trees, and lies 1,600 yards eastward of Wild Island and about $\frac{1}{4}$ mile within the eastern end of D'Entrecasteaux Reef.

Challenger Shoal, over the western end of which the *Challenger* passed, lies 107° distant $1\frac{1}{4}$ miles from Observatory Islet, with that islet in line with the northern extreme of Suhm Island. On it a depth of $3\frac{1}{2}$ inches was found, with apparently shoaler water to the eastward.

Havergal Shoal, with 4 fathoms water over it, lies with Observatory Islet bearing 331° , distant 1,300 yards. The ground is foul between it and D'Entrecasteaux Reef.

Failure Rocks are two small bare rocks about 5 or 6 feet above high water on the edge of the reef which fringes the coast of Admiralty Island. They lie $\frac{1}{2}$ mile northeastward of Richards Islet and form a good mark for entering through the northeast channel to Nares Harbor.

At $\frac{1}{2}$ mile 335° of Failure Rocks there is a shoal with $2\frac{1}{2}$ fathoms water over it, and steep-to, which breaks at times.

Reefs.—Between Failure Rocks and Moseley Point to the westward there are several reefs which break, extending about 1,600 yards offshore, and a shoal with 2 fathoms water over it lies about 800 yards northeastward of Moseley Point.

A flat rock about 400 yards offshore occupies the center of the watering bay, southeastward of Failure Rocks; 1,350 yards northwest of this rock is a reef awash, with a depth of 8 fathoms close around, except on its northwestern side, where depths of 2 and 3 fathoms were found.

Anchorage.—In that part of Nares Harbor sounded by the *Challenger*, viz, from Suhm Island eastward to Challenger Shoal, a distance of 6 miles, the depth varies from 10 to 30 fathoms, with patches having less water near the edge of the reefs. The anchorage space between Carpenter Island and Havergal Shoal is 3 miles in length by 2 miles in breadth, and apparently free from dangers.

The western part is encumbered by a chain of coral knolls which extends from the middle of Carpenter Island northeastward to the edge of D'Entrecasteaux Reef.

These knolls have depths of from $\frac{1}{2}$ to 2 fathoms on them, but deep water around and between them, being separated by channels from 300 to 600 yards in width; but as there are no marks for leading through, it is requisite, if wishing to proceed in that direction, to pilot the ship from aloft.

Directions—Northeast Channel (lat. $1^{\circ} 55' S.$, long. $146^{\circ} 41' E.$).—Between Challenger Shoal and the east extreme of D'Entrecasteaux Reef is a deep channel, nearly 1 mile broad, with depths of from 20 to 40 fathoms, leading into Nares Harbor. This is the only entrance that has been examined.

To enter by this channel, if coming from the westward, steer along the edge of D'Entrecasteaux Reef, at a distance of 1 mile, until Observatory Islet bears 185° , when haul to the southward and bring Failure Rocks, which may be easily distinguished, to bear 176° ; steer in with them on that bearing, which will lead midway between Challenger and Havergal Shoals.

When the whole Suhm Island is open southward of Wild Island, bearing 294° , the vessel will be southward of Havergal Shoal and should haul to the westward, steering toward Browne Island until the western point of Wild Island bears 5° , when steer in slowly for it, and anchor as convenient, in from 18 to 20 fathoms water, about $\frac{1}{2}$ mile from the island.

If from the northward, steer to make Observatory Islet, and when that is sighted proceed as before directed.

If from the eastward, steer to make Wild Island, and for Observatory Islet when it can be made out. The latter should on no account be brought to the westward of 230° until Failure Rocks bear 176° , in order to pass westward of Challenger Shoal.

Water.—A small river running into the bay around a black rock about 100 feet above high water eastward of Richards Islet affords a supply of good water (August), easily obtained. The British naval vessel *Conflict* anchored off here in a depth of 3 fathoms, with Observatory Islet 331° . The reef awash in the approach mentioned heretofore must be guarded against, and others may exist.

During the season of northwesterly winds there is no protection off the watering place from the wind and sea, which would render anchoring at that time impracticable.

Tidal streams.—A considerable tidal stream was observed to set both east and west in the harbor, without any perceptible rise or fall of water.

Coast.—**Boudeuse Bay** (lat. $2^{\circ} 00' S.$, long. $146^{\circ} 46' E.$) is a small indentation in the northern coast of Admiralty Island 5 miles eastward of Richards Islet. It is said that the entrance is closed by rocks.

In it is a small village and several streams of fresh water, from which vessels may obtain a supply, but there is no anchorage off it in the northwest monsoon period.

Balscot Bay, 8 miles to the eastward, is reported to be a good and well-sheltered anchorage apparently fronted by an island and reef.

Barrier reef—Los Negros Islands.—From a position $5\frac{1}{2}$ miles eastward of Observatory Islet to Los Negros Islands, at the northeastern extreme of Admiralty Island, the coast is fronted by a barrier reef, upon which are several islands having passages between them from $\frac{1}{2}$ mile to 2 miles wide.

From the northwestern extremity of Ponam, the western of these islands, a coral reef, with a breadth of about 1 mile, extends westward for a distance of $6\frac{3}{4}$ miles in a 274° direction. The western half of the island has a cocoa plantation on it; the eastern half is inhabited by about 350 natives.

Onneta is a cocoa plantation.

The British naval vessel *Conflict*, in working to windward between the barrier and the coast, found the channel 2 miles wide and the dangers distinguishable. Reefs were observed to extend from all the points of the Admiralty Island shore, and good anchorage was obtained between them in depths of from 5 to 11 fathoms. The vessel passed out to sea between the Los Negros Islands.

The passage referred to is probably that used by the German naval vessel *Möwe* in 1899. It lies between Bilo and Hauai, the second and third islands westward of the northern extreme of Admiralty Island. The western side of the fairway should be kept, as the fringing reef is more easily discerned. It has a depth of about 13 fathoms, and there is anchorage off the southern side of the bay, in from 6 to 7 fathoms water, avoiding the reefs.

The German naval vessel *Condor* anchored in about 15 fathoms water, with the extremes of Bitelu Island bearing 286° and 313° , but there were three shoals near this anchorage.

Seeadler Harbor, an anchorage in the southeast corner of the area southward of Los Negros Islands, was used by the German

naval vessel *Sceadler*, which vessel entered by the channel eastward of Hauei Island. A village named Papitalai is situated near the anchorage, and the natives reported a passage to sea through the reefs to the eastward. Another channel which exists to the southward by Bird Islet was found to be too shallow for the vessel's use.

Hauei and Ndrilo Islands are plantations.

Beacon.—A beacon with topmark of two triangles, points away from each other, has been erected in 4 feet of water on the east end of the reef in front of the station harbor, situated southwestward of Rara Island in Seeadler Harbor.

Shoal.—A shoal of soft sand and coral, on which the German naval vessel *Condor* grounded in 11 feet water, lies with the eastern point of Bitelu Island bearing 27° , distant 1 mile.

Anchorage in 17 fathoms water was here obtained by the German gunboat *Ilyane*, with the northern entrance point bearing 89° and the southern entrance point 148° . No fresh water could be obtained.

Smaller islands of the group.—**La Vandola Island**, the easternmost of the Admiralty Group, is about 600 feet above high water, nearly circular in shape, with a bold coast line upon the northern side. This island is in latitude $2^{\circ} 11' S.$, longitude $148^{\circ} 14' E.$

There is a narrow fringing reef upon the southern side only, and no anchorage could be found. The natives, whose name for this island is Balletwi, came out in great numbers in their canoes and were eager for barter.

Heavy rains and squalls were experienced in July and August.

Jesu Maria Island is about 10 miles in length in an east and west direction, 700 feet above high water, and wooded. The western part is low and even topped. The natives' name for this island is Lambutin.

Anchorage for small craft may be obtained, in from 13 to 14 fathoms water in the bay about 1 mile eastward of Southwest Point. A good lookout must, however, be kept from the masthead, as there are many shoals in it.

The reef stretching about $\frac{1}{2}$ mile from the shore along the coast extends across the entrance of this bay and the surf breaks on every part of it, except in the passage, where there is a depth of 14 feet.

There is an islet 60 feet above high water on the reef fringing Southwest Point. From the islet the reef extends about 50 yards to seaward.

The western end of the island appears to be thickly populated, the huts being numerous both on the shore and on piles in the sea.

The Horno Islets (apparently uninhabited), connected by a reef, extend about 8 miles off the northern point of the island. A reef is reported to extend about 1 mile to the northward from between the two westernmost of the Horno Islets.

There is said to be good anchorage near the northern point, where there is a large village.

Tides.—It is high water, full and change, at Jesu Maria Island at 6 p. m. The high tide takes place in the evening and the low tide in the morning, there being only one tide in the 24 hours at the time of the observations.

Los Reyes (lat. $2^{\circ} 00' S.$, long. $148^{\circ} 04' E.$), situated about 16 miles northwestward of La Vandola Island, are two islets, each about 500 yards in length and $1\frac{1}{2}$ miles distant from each other. They are low, thickly wooded, and apparently on the same reef. Another islet lies 5 miles to the westward.

Los Reyes Islets are $3\frac{1}{4}$ miles distant from each other. Mbutamanda Islet is at the eastern and Putuli at the western end of a reef 5 miles long east and west. Towi Islet lies 9 miles 253° from Putuli.

San Rafael Island, a flat island 3 miles in length and 12 feet above high water, lies nearly 16 miles westward of Los Reyes. The channel between is reported to be deep. An islet is also charted about 6 miles westward of Los Reyes.

San Gabriel Island, the native name of which is Pak, lies west-southwestward of San Rafael. It is narrow, 6 miles in length, and about 12 feet above high water with a fringing reef close to its southern shore. The island is well populated. Ulunau Islet stands on the reef fringing its northwest extreme.

Reef.—A reef on which the least depth found was $3\frac{1}{4}$ fathoms extends in a 359° direction from the western extreme of San Gabriel Island for a distance of $3\frac{1}{4}$ miles. It is connected with the island, and from its extreme the northeast end of the island bears 122° .

Anchorage.—There is anchorage southwestward of Ulunau, sheltered from southerly and westerly winds, in from 6 to 7 fathoms water, over sand and coral, about 500 yards offshore, abreast a village. (The German naval vessel *Möwe*, 1899.)

San Miguel Islands, about 70 feet above high water, lie about 10 miles west-northwestward of Jesu Maria Island. They are six in number and thickly wooded. The channel between them and Fedarb Islands is apparently foul.

Fedarb (Seppessa) Islands are three in number and thickly wooded. The easternmost one has a conical peak, about 250 feet above high water, which is remarkable, as the almost unvarying characteristic of these low coral islands is a flat sandy base with tall even-topped trees.

These islands are reported to lie 2 miles to the southward of their charted position.

Reef.—A submerged reef more than 200 yards long east and west, on which are heavy breakers in calm weather, lies about $1\frac{1}{2}$ miles 51°

from the northern end of Chokua, the northern of the Fedarb Islands.

St. Andrew Island, six in number, including a bushy islet, are all thickly wooded and from 60 to 70 feet above high water.

Violet Island (lat. $2^{\circ} 26'$ S., long. $147^{\circ} 24'$ E.), marking the northern approach to St. Andrew anchorage, is about 60 feet above high water and thickly wooded. Its native name is Ngawai.

Violet Patch, lying 334° , distant 800 yards from Violet Island, is a detached patch of live coral, on which the least water found was $3\frac{1}{4}$ fathoms. A patch with a depth of 2 fathoms over it and showing from its light-green color, lies 400 yards 26° of the island.

A shoal which exists about $1\frac{1}{4}$ miles northwestward of Violet Island was seen from the masthead of the British naval vessel *Danae*, and, judging by the color of the water, has probably from 3 to 5 fathoms water over it.

Two shoal patches, about 800 yards apart, northwest and southeast, lie about $1\frac{1}{2}$ miles northward of Violet Island.

Waikatu Island, the largest of the St. Andrew Group, is about 70 feet above high water and thickly wooded. The village, built out into the water at its southwestern end, is in ruins.

Bull, Broadmead, and Berry Islands are about 60 feet above high water and thickly wooded. Berry Island had a tall tree in its center. Bull Island is named Palaiai and Berry Island Ndreo by the natives.

St. Andrew anchorage, affording anchorage in from 10 to 15 fathoms, is tolerably well protected with room for several vessels. It is open to the benefits of sea air from whatever direction the wind blows, and at the same time protected from a heavy sea by reefs and foul ground.

The German naval vessel *Condor* (1904) anchored with the eastern point of Berry Island bearing 150° and the north point of Waikatu Island 275° .

The anchorage shown about 400 yards southwestward of Berry Island is said to be only suitable for small vessels, and the approach to it from the eastward and southward of Berry Island to be intricate between reefs which are not charted.

The natives came off in large numbers, eager to barter their obsidian spears and other curiosities for knives and old iron.

Beacons and buoy.—Two patches charted in the passage between Bull and Broadmead Islands are marked by beacons, painted white, and a shoal with $1\frac{1}{2}$ fathoms water over it, eastward of Bull Island is marked on its eastern side by a barrel buoy painted black.

Directions.—St. Andrew anchorage is easy of access. The center of Berry Island bearing 157° leads in from the northward and anchorage may be taken up in 12 fathoms water on that bearing, with

Waikatu village in line with the northern end of Bull Island bearing about 258°. Patches are charted in the passages eastward and southward of Bull Island.

Maitland Islands, 350 feet above high water, situated southwestward of St. Andrew Islands, are two in number and remarkably alike. The native name of the larger islands is Pom Mandrian and of the small Pom Lin. The ground is foul between them and the St. Andrew Group.

St. George (Lo) Island, northward of the Maitland Islands, is about 7 miles in length and from 600 to 800 feet above high water. A reef with a sand cay on it formed a good mark when rounding the reef, which extends $\frac{3}{4}$ mile off its southern end; but in 1907 the sand cay could not be distinguished and the reef was reported to extend in a west-southwest direction.

St. Andrew Strait, between St. George and St. Andrew Groups, has four or more shoals between the St. George and Fedarb Islands, two of which are nearly in mid-channel. In addition to the reef extending off the southwest end of St. George Island there is foul ground between the Maitland Islands and St. George Island.

The strait should only be attempted when the sun is favorably situated for seeing the shoals.

St. Patrick Island (lat. 2° 33' S., long. 147° 21' E.), named Baluan by the natives, is about 600 feet above high water, and, with the exception of a cliff appearing like a haycock on its northeast coast, has a tolerably even slope from coast to summit. Mock Islet (Mock Mandrian), 300 feet above high water, lies about a mile off its northeastern side. The space between is nearly blocked by a reef, there being only a channel 50 yards wide with a depth of 14 fathoms about midway. A smaller island on the northern side of St. Patrick Island is named Mocklin by the natives.

Dangers.—A shoal with $3\frac{1}{2}$ fathoms water over it lies about 500 yards 61° from Mock Islet and is not easily seen. A long shoal stretches in a southwesterly direction from the southeast point of St. Patrick Island.

Anchorage.—The German naval vessel *Möwe* found temporary anchorage southeast of Mock Islet in July, 1899.

Heuschöber Islands.—These islands, two in number, lie about 10 miles south-southeastward of St. Patrick Island (Baluan) and are $\frac{3}{4}$ mile apart in an east-northeast and west-southwest direction. The eastern island is the larger, about 60 feet high, and wooded; the western is about 110 yards in diameter and partly covered with low bushes.

Hay Rick Islands are located about 10 miles southeastward of St. Patrick (Baluan) Island, in (approximately) latitude 2° 42' 10'' S., longitude 147° 24' E. The group consists of two small islands about

$\frac{3}{4}$ mile apart in an east-northeast and west-southwest direction. Papailou, the eastern island and the larger of the two, is wooded. The western island is about 109 yards in diameter and covered with brush.

A large flat platform-shaped island, called Alim Island, is located 18 miles southwestward of Papialou Island, in (approximately) latitude $2^{\circ} 51' 15''$ S., longitude $147^{\circ} 07' 30''$ E. There is a very small trading harbor on its northern side, with depths of 16 fathoms, inclosed by coral reefs.

Platform (Sauwai) Island does not exist.

Anchorage.—The anchorage on the southern side of Elizabeth Island is formed by two reefs, and has an entrance from the southward and one from the northeastward. The German naval vessel *Seeadler* anchored here in a depth of 31 fathoms well sheltered from the northwestward.

Island reported.—At about 18 miles 241° from the Heuschöber Islands there is a large island of flat appearance. The existence of this island is doubtful.

Johnston Islands (lat. $2^{\circ} 25'$ S., long. $147^{\circ} 06'$ E.), 11 miles northwestward of St. Patrick Island, are three in number, with a bushy islet. They are about 70 feet above high water and thickly wooded. Several reefs are reported in the vicinity of Johnston Islands and will be best seen by referring to the chart.

Stuart Bank, lying about 5 miles 281° from the Johnston Islands, consists of a reef and sand bank, without vegetation. The highest part, near its center, is about 4 feet above high water.

A reef is reported to lie about $3\frac{1}{2}$ miles northeastward of Stuart Bank.

Sugar Loaf (Buke) Island, westward of Stuart Bank, is about 800 feet above high water and 3 or 4 miles in circumference, having seven islands, some high, a few miles northward of it. Reefs extend from the southern and eastern sides of the island and there are reefs between it and the islands to the northward.

Several islands are charted southwestward of the Sugar Loaf, the existence of which is doubtful. The German naval vessel *Planet* (1906) passed from 2 to 8 miles distant from the positions of these islands without sighting them from the masthead, but two reefs, one about a mile in extent in a northeast and southwest direction and the other small, were seen to the northward of the charted position of Sugar Loaf Island.

Larsen Reef, on which the Norwegian schooner *Larsen* is reported to have struck in 1894, is charted with the Sugar Loaf bearing 81° , distant about 23 miles.

Sabben Rocks, low and wooded, are charted 16 miles westward of the southwest point of Admiralty Island with reefs westward and

northwestward of them. They are reported to lie 3 miles westward of the charted position.

Western Islets lie about 15 miles farther westward on a reef, with detached reefs northeastward and westward of them. They are covered with coconut trees. It is reported (1906) that there is now only one low island with some clumps of coconut palms, but a reef extends from 2 to $2\frac{1}{2}$ miles northeastward, having on it several large boulders and driftwood aground.

Petersen Reefs.—This chain of reefs, probably awash, and extending 6 miles in a northwest and southeast direction, is situated 17 miles 137° off Western Island.

Reefs.—Numerous reefs are reported to exist in the area bounded by Western Island, the southwest point of Admiralty Island, Sugar Loaf Island, and Petersen Reefs.

Sisi Mandrian and Sisi Liu, two islands off the west coast of Admiralty Island (Manus), are reported to lie about $2\frac{1}{2}$ miles to the westward of their charted position.

Purdy Islands are a small group, of coral formation, lying southwestwardly of Admiralty Island. They were, together with many others in this vicinity, first reported in 1817. A German party in quest of phosphate deposits were located on these islands in 1889–1891.

The islands are not permanently inhabited, but are visited periodically by natives of the Admiralty Group, who gather coconuts, fruit, and other produce.

The westernmost, known as Bat Islands, consist of two flat islands and an islet, covered with coconut palms and encircled by a coral reef, close to which there is no bottom at 20 fathoms. Anchorage is marked westward of these islands.

Mouse and Mole Islands (lat. $2^{\circ} 51' S.$, long. $146^{\circ} 21' E.$) lie eastward of Bat Islands and are about 3 miles apart in a northeast and southwest direction. Mole is $\frac{3}{4}$ mile in length and three or four times larger than Mouse, and in places its interior is lower than the shore, being swampy and covered with undergrowth. Its shores are sandy, and it is surrounded by a reef which forms a bay on the southwestern side of the island.

The best landing place on Mouse Island is on the southwestern side. This island is covered with trees.

Latent Reef is a small reef southwestward of Mouse Island. There is an islet in process of formation, with vegetation on it.

Current.—A strong easterly current was experienced in the vicinity of these reefs in the months of February and March.

Weather.—The following remarks on the Purdy Islands are from the above-mentioned party, and apply to 1890–91. The rainfall appears to have been abundant the whole year through, although it

may be irregular in other years. Thus, in May and June, 1890, there was settled weather and but little rain, but in July and August there was a great deal of rain; January, 1891, was persistently wet; from February 3 to 24 violent rain squalls occurred every day; in May there was rain every day; in July the weather was still worse, whole sheets of rain falling daily toward morning, with an almost constantly northwest wind.

No southeast wind got the upper hand this year until July. From August 2 to 20 fine weather prevailed, although there was rain every night, and then, with a violent northwest wind, the weather again became disturbed. In September the weather was fine and calm, although it rained every night. The latter also occurred in November. An observer estimates the number of rainy days in the month as about 25.

In the year 1888 the northwest monsoon set in on October 23.

Anchorite Islands—General remarks (lat. $0^{\circ} 54'$ S., long. $145^{\circ} 30'$ E.).—These islands, discovered by Bougainville in 1768, are five in number and lie to the northwestward of Admiralty Island. They occupy a space of about $2\frac{1}{2}$ miles in a northeast and southwest direction and are low flat islands thickly covered with coconut trees and connected to each other by a reef. The northernmost is the largest island, being about $\frac{1}{2}$ mile in length.

Along the eastern side of the group there is a fringing reef. Off the northern end the reef extends about 50 yards, with tide rips beyond. Off the western side the reef extends about 300 yards, and at the southwest end of the group it extends nearly $\frac{1}{2}$ mile.

No anchorage could be found on the western side of these islands, there being a depth of 90 fathoms 100 yards distant from the reef.

There are two canoe passages, through the reef on the eastern side of the southern island, on which there is a trading station.

The natives somewhat resemble the Chinese in features, being of a light color, with long, straight, black hair, which they wear closely rolled up on top of the head. The population was estimated at about 90 and was considered to be dying out. Their houses are partially concealed behind an elevation of the beach, the semicircular roofs only being visible from the offing. (*Alacrity*, 1874.)

Commerson Islands, lying about 16 miles northwestward of the Anchorite Group, are two in number, lying in a northeast and southwest direction from each other. The southwestern is the larger of the two, and is nearly flat and covered with large trees and coconut palms. The northeastern is small, and also covered with palms.

Islands (lat. $0^{\circ} 00'$, long. $146^{\circ} 00'$ E.).—The existence of two islands on the Equator was reported in 1877 by the master of the

bark *Adventurer*. They are stated to be each $\frac{1}{2}$ mile in extent, connected by a reef, and covered with low trees. The German naval vessel *Albatross* in 1886 passed within 4 miles of the alleged position without seeing anything of these islands, and in 1908 they were unsuccessfully searched for. A sandbank is shown on the chart in the position of the islands.

A shoal with a sandy summit was reported (1901) in the locality 1 mile northward of the position given, and it may be presumed that the trees have been washed away.

Hermit Islands—General remarks.—These islands, named Los Ermitanos by Maurelle, are described by D'Entrecasteaux as being high in the northwest part and inclosed by a narrow belt of reef, within which is a large space of still water. They are inhabited, the natives being friendly. A German trading company have a lease of the islands.

The group consists of 17 densely wooded islands, surrounded by a reef, the exterior limits of which extend about 10 miles in a north-and-south and 14 miles in an east-and-west direction, the eastern part being encumbered with coral patches.

Luf Island (lat. $1^{\circ} 31' 12''$ S., long. $145^{\circ} 02' 48''$ E.), about 800 feet above high water, lies near the center of the atoll, and is the highest of the group. The observation spot is near its northeast end. The trading station is on Maron Island, the southwestern of the central islands, and the trader's house, which is white and stands on the southern side of a hill, is conspicuous and a good mark.

Jalun, Maron, and Akib Islands are situated to the westward of Luf Island, and there are two native towns, one on Luf and one on Jalun (Gelun) Island, but the population has greatly decreased, owing to disease.

Jalun Island has been cleared of wood, only a few high coconut palms remaining.

Maron Island—Pier.—A pier about 80 yards long, with an arm extending eastward from the end, projects from the south side of Maron Island. A beacon is erected on the edge of the shore reef a short distance southwestward of the pierhead.

Communication.—The North German Lloyd steamers between Sydney and Hongkong call about every three months.

Supplies of taro, fish, pigs, and fowls may be obtained at Luf Island, and water on its southwest side.

Passages in the barrier reef.—There are five passages through the reef, of which the west entrance (Sautina) is the principal.

The north passage lies 4 or 5 miles northwest from Zet Island. This passage is narrow and there is generally a swell setting into it.

West entrance—Beacon.—An iron beacon, with cylindrical topmark, 26 feet in height, has been erected near the southwest extreme of Northwest Reef.

Leading beacons.—**Front:** A white pyramidal beacon, 16 feet in height, stands on the reef close to the northeast extreme of Maron Island.

Rear: A white square beacon, with hourglass shape as topmark, 25 feet in height, stands on the southwest coast of Akib Island at a distance of 1 mile 222° from the front beacon.

These leading beacons in line bearing 222° lead through west entrance in the deepest water.

Lights.—At night, when requested, a white light is shown from each of these leading beacons for the use of vessels entering or leaving.

Dangers.—Two detached shoals lie southward of Maron Island; from the western, on which the depth is $3\frac{1}{2}$ fathoms, the trader's house on Maron Island bears 35° and the south points of Akib and Luf Islands are in line, 83° .

The eastern shoal, with 3 fathoms water over it, lies about $\frac{1}{2}$ mile east-southeastward of the western.

Anchorage may be obtained to the southward of Maron Island, in a depth of about 15 fathoms, over mud, with the eastern end of Peegue Island bearing 183° and the northern point of Amota Island 264° .

Anchorage may also be taken up southeastward of Akib Island in $17\frac{1}{2}$ fathoms water, over sand, with the south point of that island bearing 357° and the western point of Luf Island 46° .

Directions.—A notch in the center of Jalun Island kept in line with a deep dip between the two highest hills on Luf Island bearing 98° is said to lead through the west channel, southward of a reef, with $4\frac{3}{4}$ fathoms water over it, which lies in the middle of the entrance, but by the plan this leads close to the southern point of the entrance reef.

Alacrity Harbor (lat. $1^{\circ} 29' S.$, long. $146^{\circ} 06' E.$), formed by a hook in the reef on the northeast side of Hermit Islands, affords good shelter in from 8 to 10 fathoms water, over sandy bottom. The entrance is divided by a reef 400 yards in extent, which breaks.

There is no passage inside the reefs from Alacrity Harbor to the trading station.

Coeran Passage, the northern channel to Alacrity Harbor, is about 100 yards wide, with depths of from 4 to 5 fathoms near the center.

Jalun Island, open northward of Luf Island (Zet Island being at the same time in line with the center of Jalun Island) bearing about 252° will lead to the entrance of the passage; and the center of

northeastward or Peme Island bearing 308° will lead through the passage into Alacrity Harbor.

Sabben Passage, the southern channel, is about $\frac{1}{2}$ mile wide. The inner part is contracted by a reef with 3 feet water on it.

Caution.—It would not be advisable to attempt either of these passages under sail during the strength of the tidal stream without a commanding breeze, as the tide rips render it difficult to discern the reefs and shoals may exist that have not been charted.

Tidal stream.—At the anchorage the only stream that is felt is for about four hours after low water, when it runs nearly 3 knots an hour in a southwesterly direction. There appears to be only one tide in the 24 hours.

Boudeuse Island (lat. 1° 27' S., long. 144° 33' E.), so named by Bougainville after his vessel, lies westward of the Hermit Group. It is low, sandy, densely wooded with high trees, and is in the shape of a horseshoe open to the westward. It is situated on the eastern edge of a coral reel inclosing a lagoon, into which there is no passage. The island is uninhabited, but is occasionally visited by the natives of the neighboring islands.

L'Echiquier Islands (lat. 1° 03' S., long. 144° 24' E.).—This is a series of low flat islets, named by Bougainville, L'Echiquier (the chessboard). They are covered with wood and inclosed by a narrow reef, through which there are several passages, the one chiefly used being on the northeast side. The nearest part of the reef on which they stand is about 12 miles northwestward of Boudeuse Island. A German trading company has a lease of these islands.

During the visit of the schooner *Franz*, in 1872, the number of islands of this group counted was 53.

The natives, numbering about 800, are of a dark-copper color, with long, stringy hair, and were frequently at war with the Hermit islanders.

The position given is that of the northern extreme of these islands, as determined by the British naval vessel *Espiègle* (1883).

The currents in this locality appear to be influenced by the wind, with a little deflection near the islands, the average rate being about $1\frac{1}{4}$ miles per hour.

Allison Island.—The master of the British steamer *Fei Lung* in 1886 reported the existence of an island lying between L'Echiquier group and Durour Island, seen when on the passage from Sydney to Shanghai.

This island is about 300 yards in extent, inhabited, and 60 feet high. It is surrounded by a fringing reef. The *Fei Lung* passed about midway between Durour and Allison Islands and at an estimated distance of 6 to 8 miles from both islands, which were visible at the same time.

Position approximate. Latitude $1^{\circ} 17' S.$, longitude $143^{\circ} 40' 45'' E.$

Durour Island (lat. $1^{\circ} 27' S.$, long. $143^{\circ} 06' E.$) is a small flat island discovered in 1767.

The steamer *Jessie Burns* in 1908 passed this island at a distance of 4 or 5 miles, and reported it to be densely wooded, apparently inhabited, and about 120 feet high to the tops of the trees.

The southeastern extremity appeared as a bluff headland, and some rocks above water were seen extending a short distance from the northwest point.

Maty Island, distant about 23 miles southeastward of Durour, and discovered at the same time as that island, is low, covered with trees and coconut palms, and about 5 miles in length in an east-and-west direction by 4 miles in breadth north and south. It is surrounded by a reef. A German trading company has a lease of the island, which is said to be thickly populated, the inhabitants, who are apparently friendly, being very clever and also skillful carpenters. Rats abound on the island and the natives object to their destruction.

Anchorage.—There is said to be indifferent anchorage on the southern side.

Rocks.—The master of the steamer *Cape Corso* reports that when approaching this island from the northwestward he observed two rocks above water, with patches of broken water between them and in their vicinity.

These rocks are charted about 9 miles 304° of Maty Island.

CHAPTER XIV.

THE MARSHALL ISLANDS.

Marshall Islands.—This group consists of two chains of atolls lying nearly parallel to one another in a northwest and southeast direction, the eastern group being named the Ratack (Sunrise) and the western the Ralick (Sunset) Chain.

The language spoken in all the islands is substantially the same, though differing from that of the Caroline Islands, situated to the westward.

Owing probably to the rainy climate these islands are far more fertile than the Gilbert and Ellice Groups.

The broken coral surface of the ground is often covered with a luxuriant growth of plants. The jack-fruit tree grows to a great size and in large numbers, and the true breadfruit, where introduced, seems to flourish.

Missions.—In 1855 the Rev. D. Pierson, of the Micronesian mission, visited several of the Ralick Islands, and in 1857 the Rev. Mr. Doane was established at Ebon or Boston atoll.

In 1883 several Christian teachers belonging to the American Missionary Society were established in the Marshall Islands.

Winds and weather.—Temperature is extraordinarily uniform. Clouds very prevalent; in general its amount decreases from morning till evening.

Rain very prevalent, almost incessant. Every month has at least 24 days with rain, and the large majority of those with rain over 0.04 inch.

Thunderstorms are comparatively rare; they occur mostly from July to September.

The reports of old residents, both white and native, state that the northeast trade sets in in December and lasts till April. In some years this trade appears very slightly or not at all. In these cases a southeast wind blows more or less steadily for the interval.

From May to November east winds blow. They are irregular as to force and duration.

From August to November these east winds are at times interrupted by strong southwest winds (storms), and calms are also not infrequent at the same season.

During the northeast trade the weather is often squally, and when a squall begins the wind shifts from northeast to east and even to southeast and south; but when the squall is over the wind comes back to northeast again. No west winds are registered, though these may occasionally blow.

The currents.—The currents among the Ellice, Gilbert, and Marshall Groups are so irregular and uncertain both as regards strength and direction that no satisfactory results have yet been deduced from the observations taken. Between November and March they can not be depended on for 24 hours at a time, especially between latitudes 3° S. and 4° N., where they have been observed to run westward one day at the rate of 36 miles per day, then no current for one or two days, then east-northeast for several days and back again to west and northwest, and so on, changing almost every day.

From the end of March to the end of October the current is more regular between latitude 8° S. and 4° N., running 2 knots per hour to the westward and northwestward. Occasionally there is no current at all for a day or two, or it may run to the eastward, and then back again to the westward.

Between latitude 8° S. and 12° S. the currents were between west-southwest and south, from $\frac{1}{2}$ to $1\frac{1}{2}$ knots per hour.

In north latitude between 4° N. and 8° N. the current runs between east and north-northeast, from $\frac{1}{2}$ to 2 knots per hour.

Caution.—These currents can not be depended on. They are much influenced by the wind, and great vigilance is necessary in consequence.

Keats Bank is situated eastward of the Marshall Islands. Soundings of 13 fathoms were found in latitude $5^{\circ} 57' N.$, longitude $173^{\circ} 37' E.$, and the bottom was distinctly seen. Keeping the same course for half an hour the soundings gave $4\frac{1}{2}$ fathoms, when the ship was tacked to the northeastward, and the shoal almost immediately cleared.

The position assigned to the shoal, from good observations, is in latitude $5^{\circ} 55' N.$, longitude $173^{\circ} 38' E.$

Mille, or Mulgrave Atoll, is the southernmost of the Ratak Chain. Between the northeast point and the northwest point of the group there are good passages for vessels. The best is that eastward of Ennanlik. The reefs in the pass are nearly awash and therefore easily seen. The best anchorage is at the southeast end of the lagoon in 8 fathoms.

Mille Island is situated on the western extreme of the southern reef. It is the residence of the native chief, and the greater part of the population reside there. All are Christians, a missionary living among them. The anchorage is off the east extreme in 16 fathoms, and there is good landing.

Between Mille Island and Port Rhin there is no passage for even a boat over the reef, and southeastward from Mille Island are a few low islands visible from a short distance only.

Lukunor Island, occupying the extreme southeast part of the group, has a narrow passage upon the western side about one-third from Lukunor toward the next island westward. It is only from 70 to 100 feet wide, and has a depth of $1\frac{1}{4}$ fathoms in it. There is a good anchorage northward of Lukunor protected by reefs.

Port Rhin is at the northwest extreme of the group. The island forming the western side of the entrance is named Tokowa. Upon it are situated the stores of a mercantile firm. The island forming the eastern side of the entrance is named Burrh.

The course in is about 155° , the channel, nearly 500 yards wide, being straight until inside the islets, with depths of from 10 to 20 fathoms. The tidal stream is strong, but it runs nearly in the direction of the channel, and does not, therefore, affect the navigation much if under steam. A sailing vessel should not attempt this passage except with a fair wind.

When proceeding for the anchorage hug the western reefs, passing between it and a reef lying 30 yards off its southeast extreme, then hauling to the westward, avoiding a 2-fathom patch 300 yards southward of the extreme of the reef, and anchor as convenient in about 15 fathoms, mud and sand, 400 yards 188° of Tokowa Reef, with the east extreme of Tokowa Island bearing about 20° , distant $\frac{1}{2}$ mile. Navigation should be conducted from aloft, with the sun in a favorable position.

A rock with $2\frac{1}{2}$ fathoms is situated 160° , distant 650 yards from the observation spot on Burrh Island, and between this rock and the fringing reef to the northward are numerous shoal heads.

The shoal of $2\frac{1}{2}$ fathoms water, charted 400 yards southeastward of the above, was unsuccessfully searched for on different occasions.

Reiher Pass is situated $6\frac{1}{2}$ miles eastward of Port Rhin, bounded on the west by Jobenor Island.

The passage from Port Rhin entrance through the lagoon to Arbar Island is clear up to a reef 2 miles north of Arbar. The course from Arbar to Enajet or Lukunor along the southern islands is not recommended; it is better to go north of the numerous reefs which front these islands. The reefs are difficult to make out, except in a favorable light.

Supplies.—Fresh water of a fair quality can be procured from pits or wells near the center of Burrh Islet. Wood may be procured in small quantities, as also a few fowls and pigs.

Position.—The observation spot on Burrh Island is in latitude $6^{\circ} 14' N.$, longitude $171^{\circ} 46' E.$

Tides.—It is high water, full and change, at 4h.; springs rise 6½ feet.

Caution.—Fish are plentiful, but should be used with caution, as many of them are poisonous.

Knox Islands.—This group of islands, 10 in number, extend 5 miles in an east-and-west direction and form a small atoll, having a boat passage to the lagoon at the west extreme, and situated 3 miles southward of Mille, and separated from it by Klee Passage.

Arhno Atoll, lying 40 miles northward of Mille Atoll, has a greater extent of land than any other atoll in the Ratack Chain. It is of a singular shape; most of it is covered with ironwood, coconut, and breadfruit trees. This atoll is about 55 miles in circumference, measuring from point to point. It is of coral formation, the land being from 100 to 600 yards in width, surrounded by the fringing coral reef common to these islands. The islets are from 6 to 8 feet above the sea, and the trees grow from 20 to 70 feet high.

The land forming the northeast point of Arhno Atoll trends in an unbroken line for 5 miles, and with the reef to the northward it incloses a semicircular lagoon about 2 miles in length and 1½ in width, with a boat passage on its northwest side.

Northwest Point.—From Dodo Pass the barrier trends northward 9½ miles to Northwest Point, where there is a shallow lagoon formed by a fork in the reef. This atollon is about 1½ miles in length and ¾ mile in breadth, having numerous small wooded islets on the reef on either side. There is a coral reef extending off this point about 2½ miles, with from 4 to 6 fathoms water. Fish are plentiful on the reef and it is not an uncomfortable place to anchor for a night in quiet weather.

There is no passage even for boats over the northwest reef.

Trading station—Anchorage.—The trading station is on Ine Island, on the south side of the lagoon. Abreast the houses there is a cut in the fringing reef, which permits landing at the station from boats at all times of tide. There is anchorage off Stony Point, abreast the station, in from 15 to 20 fathoms, but it is unsafe except with an easterly wind.

Lagoon entrances.—There are several entrances to the lagoon on its northeast side, as described below. It is somewhat doubtful which is the best of them.

The eastern portion of the lagoon appears tolerably clear of dangers, but the west side is reported to be foul.

Between Tagelib Pass and the trading station at Ine the depths obtained were from 20 to 23 fathoms, and nearly midway between these places is a bank of small extent, affording anchorage in 15 fathoms.

The anchorage off Arhno is not recommended, the depth being 30 fathoms and the bottom is rocky.

East Pass has $3\frac{1}{2}$ fathoms in it at high-water neaps, but there is also a patch with $1\frac{1}{2}$ fathoms to be avoided. The course in through East Pass is about 177° . This passage is eastward of Tagelib or High Island, so called from the trees growing so much higher than those on the adjacent islets that it has the appearance of higher land, and is conspicuous from all parts of the atoll.

A direct course from East Pass to the anchorage off the trading station at Ine leads close westward of three small patches situated about 3 miles within the entrance. There is also a 1-fathom shoal lying about $1\frac{1}{2}$ miles southward of Tagalib Island and in the fairway to the trading station.

Tagelib Pass.—This passage, westward of Tagalib Island, or High Island, and formerly known as a boat passage, is said to be the best. The least depth found in the passage was $3\frac{1}{2}$ fathoms.

Dodo Pass is about 3 miles westward of Tagelib Pass, and will be recognized by a small wooded islet on the inner edge of the reef, a little to the right of mid-channel. The course in is about 211° , passing eastward of the small islet. It is difficult to steer given courses in these passages, owing to the strong tides which at times sweep almost directly across the channel. The eye is the only safe guide in this kind of navigation. Dodo Passage is considered to be preferable to East Passage, being wider and clearer. It can be seen only from a short distance, as the islets on either side and that on the inner edge of the reef appear to be one.

Doubtful Reef.—A reef was reported about 30 miles from the eastward of Arhno Atoll in 1904, in latitude $7^{\circ} 06' N.$, longitude $172^{\circ} 25' E.$ It was unsuccessfully searched for by the German naval vessel *Condor* in the above (amended) position, but as the natives of Arhno state that there is a reef in that locality, it has been placed on the charts with P. D. against it.

Fordyce Channel separates Arhno Atoll from the Majuro Islands.

Majuro, or Arrowsmith Atoll, comprises 33 islands, some of which are very small. The largest island, named Majuro, is 25 miles long, and occupies the southern and western sides of the lagoon.

Lagoon entrance.—There is no anchorage outside, but the lagoon may be entered from the northward. The entrance is about $1\frac{1}{2}$ miles wide, with a coral bank with 3 fathoms or less water dividing it into two channels, the least depth in which is about 7 fathoms.

The entrance is easily recognized by the small islet on its western side and by the island of Calalin on the eastern side, with a small island just east of Calalin covered with small trees and having the appearance of a brig under sail.

The west channel is near to the western islet, the reef the islet stands on forming the west side. When entering this is perhaps the easier channel to distinguish, but it has the disadvantage for a sailing vessel of being farther to leeward during easterly winds.

When making this channel from the eastward keep the small islet on the western side a little on the port bow, steering 267° until the passage is seen. A 211° course leads through. Having passed through, steer for a remarkable small sharp gap in the island on the east side of the atoll until the white buildings on Ejit Island (on the north side of the lagoon) are seen, when a course may be shaped for the anchorage.

A sailing vessel entering the east channel with an easterly wind must luff close around the reef off Calalin Island on the east side of the entrance. When through, steer for the before-mentioned sharp gap, bearing 110° until the white buildings are seen. This course leads close to two shoal patches (both easily seen), one about a mile from the entrance, the other laying off a small sandy spit 4 or 5 miles to the eastward.

The anchorage of Ejit Island is $9\frac{1}{2}$ miles from the entrance of the lagoon.

A beacon has been placed on the shoal situated 2,200 yards 194° from the southern flagstaff on Ejit Island, and when a vessel is observed in the lagoon toward sunset a light is placed on the beacon by the traders (reported to have disappeared in 1906, but will probably be restored).

There is an anchorage under the lee of Ulikar, the easternmost island of the group, in 22 fathoms. There are several small patches of coral inside the lagoon, but they can be easily avoided, as they are distinctly visible from the masthead with a good light. Good anchorage will also be found in 25 fathoms about 600 yards from the European trading stations on Jeridi Island.

The western portion of the lagoon is much encumbered by reefs, through which there are intricate channels to an anchorage in 4 fathoms off Majuro, with the north extreme of that island bearing 323° and about $1\frac{1}{2}$ miles offshore.

Current.—Inside the lagoon there is an almost constant westerly current; when working up, keep over to the north shore to avoid the strength of it.

Caution.—There is no entrance on the east side of the atoll. The openings between the islands are only fit for canoes.

Supplies.—Coconuts, taro, and fowls can be obtained.

Tide.—It is high water, full and change, at 4h. 45m.; springs rise about 6 feet.

Aurh, or Ibbetson Atoll, about 53 miles northward of Majuro Island, extends 13 miles in a north-west and southeast direction, and

its greatest breadth is 6 miles. It comprises 32 islands, which are inhabited.

Bigen Island with Tabal and Aurah are the main islands on this atoll. Most of the islands are covered with trees and can be seen for some distance.

Entrances.—The mission vessel *Morning Star* entered the lagoon through a passage about 200 yards wide near the southeast end of the islands. There is a shoal place across this passage with only $2\frac{1}{2}$ fathoms on it at low water. On leaving the lagoon, one of the passages which were found through the northwest reef was used.

The best entrance is the one south of Bigen Island, the course through being 143° , afterwards turning to 76° . The two other passages are reported shallow but navigable for craft up to 12 feet draft. Between the shoals in the lagoon there are depths of 30 to 40 fathoms.

There is good anchorage in the lagoon in 21 fathoms with the extremes of Tabal Island bearing 11° and 126° .

It is possible that there is a sunken ridge between this atoll and Arhno Atoll, as with strong trades a heavy cross sea has been observed there.

Maloelab, Kaven, or Calvert Atoll, which is separated from Aurh by a channel about 7 miles wide, is 35 miles long northwest and southeast and 15 miles wide, consisting of 64 islands and islets. They are inhabited.

Taroa—Trading stations.—The principal island of this atoll is Taroa. The trading station is situated on it.

Entrances.—The four best passages into the lagoon are the passage south of Kaven, that north of Bebi, that east of Enijun, and the south entrance. With a good light, which is necessary for all these passes, the one east of Enijun is the best. The course from this passage to the anchorage off Taroa is 62° , and leads clear of dangers. Inside the lagoon the depth varies from 30 to 40 fathoms.

South passage is recommended as a good channel by which to enter the lagoon, the southeastern part of which is much clearer of shoals than the western. This passage is situated about 7 miles northwest of Gogan Islet at the southeast extreme of the group. Inside the passage a reef, which dries at low water, divides the passage into two channels. The least depth found was 20 fathoms.

Approaching from the eastward steer along the reef until the opening is recognized. The course in is 20° , altering to 76° , through the eastern of the two channels and to clear the above-mentioned reef.

There is good anchorage in from 6 to 15 fathoms, sand and shell, off the trading station at Taroa Island. in the greater depth, with the extremes of that island bearing 50° and 135° .

Landing on the island is easily effected on a sandy beach.

There is anchorage northeastward of Kaven within the entrance, 400 yards from a small islet; the depth, however, is considerable.

Tjan, on the northeast side, is a well-cultivated island, growing coconut, pandanus, and breadfruit. There is an anchorage off it.

Airik Island, in the southeast end of the lagoon, affords anchorage in 8 fathoms water about 120 yards from the shore.

Tides.—It is high water, full and change, at 4h. 35m.; springs rise 5 feet.

Erikub, lying about 41 miles westward of the Maloelab Atoll, is about 26 miles in length northwest and southeast. The islets are situated on the southern side of the reef, the largest near the south point, being (formerly) the only one with coconut trees on it. There is a narrow but deep passage into the lagoon on the east side, and a wider pass on the west side near the south extreme. There are few reefs in the lagoon, which is easily navigated.

There are no inhabitants.

The south end of atoll is reported to be 8 miles farther north than shown on the chart.

Wotje, or Romanzov Atoll, situated a few miles northward of Erikub, is 30 miles long east and west and has an average breadth of 10 miles.

On the reef are 65 islands and islets, situated principally on the northeast and southeast sides. These inclose a magnificent lagoon, the openings into which are on the southwest and south sides. This lagoon, though containing numerous rocks, heads, and shoals, is navigable for large vessels. This group is inhabited.

The principal entrances to the lagoon are the Rurick and Schischmarev Passes.

Rurick Pass, $5\frac{1}{2}$ miles southeastward of the west point of the atoll, is 250 yards across at the narrowest part, very deep outside and in the middle, over 20 fathoms inside, over a coral bottom.

Schischmarev Pass is on the south side of the lagoon. The channel is safe and 300 yards broad at the narrowest part, and deep in the middle.

This pass is to be preferred to Rurick Pass, being wider and permitting vessels sailing in or out with the usual trade wind. The pass is also visible for some distance, there being islands on either side of it.

Lagoon anchorages.—Christmas Harbor (of Kotzebue) is situated near the westernmost islands on the north side of the atoll. Anchorage may be obtained here in 10 fathoms 400 yards southward of the reef connecting the two islands westward of Goat Island, and the same distance westward of a reef visible at low water. This anchorage is sheltered during the strongest winds.

Goat Island, the fourth from the westward, is covered in many places with wood, consisting of pandanus and breadfruit trees; coconut trees are scarce.

Anchorage may be obtained off the ninth island from the westward, a reef extending southward from it affording slight protection. It is, however, not so convenient as Christmas Harbor.

There is also anchorage off Ormed, the northernmost island of the group, in 15 fathoms, 1,200 yards from the shore.

Wotje or Otdia, the easternmost and largest of the group, lies 8 miles southeastward from Ormed and is $5\frac{1}{2}$ miles in circumference. Breadfruit and pandanus are abundant and water is collected here in pits.

About 400 yards off this island there is anchorage in 8 fathoms over fine white sand. The position of the anchorage was found to be in latitude $9^{\circ} 28' N.$, longitude $170^{\circ} 17' E.$

Likieb Atoll.—There are 44 islands comprised in this group, which lies 32 miles 301° of Wotje Atoll. The largest, situated in the southeast extreme, is named Likieb and is planted with coconuts. It is said to be well adapted for a settlement, having a supply of good water.

The northwestern part of this atoll is reported to extend farther to the northwestward than charted.

Entrances.—The passage into the lagoon for vessels is South Pass, near the middle of the southern reef.

The pass is divided into three channels by two small islands just inside the lagoon. The western islet is only a sand bank. The eastern passage is reported to be the best.

There are two passages northward of Kopenor Island on the west side of the group, suitable for small craft only. The northern one is the better, but both channels are obstructed by reefs.

The lagoon is tolerably clear of reefs in the northern part, but much obstructed by dangers in the southeastern portion.

Anchorage may be obtained outside the lagoon off the above-mentioned western passes.

The anchorage in the lagoon off Likieb is in not less than 9 fathoms, good holding ground, and sheltered from all winds, either by reefs or islands. The shore here being steep-to, the trading vessels find it a convenient place for heaving down.

There is also good anchorage in from 5 to 15 fathoms westward of the island next north of Likieb, on a gradually shelving bottom of sand and mud.

Jemo or Temo Island is a small, uninhabited, thickly wooded, sandy island about 22 miles northeastward of Likieb, $\frac{3}{4}$ mile in extent. It is visited by the inhabitants of Likieb and Ailuk for catching turtle.

The island may be approached on its western side to within about $\frac{1}{2}$ mile, but a reef with breakers extends 5 miles from the northeast side. Discolored water with depths of from 20 to 30 fathoms extends thence to the southwest part of Ailuk.

The commander of the German naval vessel *Cormoran* reports that this island is charted 11 miles too far to the eastward of its position, which he gives as latitude $10^{\circ} 5' N.$, longitude $169^{\circ} 31' E.$

Ailuk, Tindal, or Watts Atoll is 18 miles long north and south and 5 miles wide.

The eastern side of the atoll is a chain of islets, the southern and western sides being merely coral reef.

Near the northern part of the western reef there are reported to be two narrow but clear passages into the lagoon at high water, and also a boat passage near the western part of the south reef.

The anchorage in the lagoon is in 12 fathoms not nearer than $1\frac{1}{2}$ miles from Ailuk Island, which is at the southeast corner of the group. The anchorage in the northern part is better.

Good water can be obtained at Ailuk.

Kapenius Island, at the northern end of the group, is about 4 miles in circumference. There is anchorage for small craft under its lee in 6 fathoms, about 100 yards distant from shore.

Mejit, Miadi, or New Year Island, situated 50 miles eastward of Tending $3\frac{1}{2}$ miles to the northeast, from 1 to $1\frac{1}{2}$ miles on the north and west sides, and about 400 yards to the southward. It is inhabited, and there are trading stations where schooners call regularly. There is no anchorage.

There is a good landing place on the west side near the south point, but it is, as a rule, inaccessible during the months December to April.

The center lies in latitude $10^{\circ} 18' N.$, longitude $170^{\circ} 55' E.$

Taka or Suvarov Atoll, about 35 miles northward of Ailuk, consists of small uninhabited islets, joined together by coral reefs which surround an apparently deep lagoon, into which there is no good passage.

The south point is in latitude $11^{\circ} 2' N.$, longitude $169^{\circ} 48' E.$

The channel between Taka Atoll and the next atoll to the northward (Utirik) is deep.

Utirik or Kutusov Atoll, about 20 miles long and triangular in shape, is larger than Taka, and the islands are chiefly on the southeast and south sides. They are inhabited. The reefs extend as far to the northward as latitude $11^{\circ} 29' N.$, longitude $169^{\circ} 54' E.$

There is a pass into the lagoon at the middle of the west side, but the navigation in the lagoon is difficult and must be conducted from aloft.

Bikar or Dawson Atoll lies about 50 miles 19° of Utirik. All the islands are situated upon the eastern reef, and are covered with trees,

but there are no coconut trees. There is a settlement upon the southern island, but it is not permanently inhabited. There is a passage for small craft into the lagoon through the western reefs, but it is dangerous on account of the rapidity of the tidal streams. There is no ship passage.

This atoll is reported to be situated 13 miles southwestward of its charted position.

Taongi, Smyth, or Gaspar Rico Atoll is the northernmost of the Marshall Islands. The southwest extreme of this group is situated in latitude $14^{\circ} 31' N.$, longitude $169^{\circ} 01' E.$

The islands are low and thinly covered with ironwood and bushes, and are situated upon the eastern and northern reef. The western reef consists of two parallel reefs having a boat channel into the inclosed space, which has 30 fathoms water in it.

There is a passage into the lagoon for boats, with Sibylla Island bearing 98° , but there is no anchorage.

This atoll is reported to be situated 20 miles northwestward of its charted position.

Ebon or Boston Atoll, the southern of the Ralick Chain, is 17 miles in circumference. It is composed of 21 islets at irregular intervals on the reef.

Ebon Islet is 5 miles long and from 200 to 1,000 yards wide, forming the south and southeast sides of the atoll. It is much the largest and most important of the group.

The mission station is near the southwest end.

Lagoon entrance.—The passage is between the second and third islets, northwest of the west end of Ebon. The northern islet is Mej and the other Juridi. As this is the only break in the reef, the channel is not readily mistaken.

The passage is narrow and crooked, with strong tidal streams, making it unsafe except at slack water. The ebb runs 7 knots an hour at spring tides and from 3 to 4 at neaps; the flood is not so strong. The general direction of the channel is 19° from the entrance to the point of the reef off the inner end of Juridi, then 76° into the lagoon. The width of the channel off the inner end of Juridi, where it is necessary to change the course about 5 points, is 140 yards, and at the inner extremity of the passage 120 yards. The depth of 9 fathoms at the latter point is the least water found in the channel.

Directions.—To enter the lagoon under steam, steer in with the middle of the entrance bearing about 19° and keep in mid-channel till opposite the outer end of Juridi; then, if the ebb tide is running, keep well over toward Mej till off the point of the reef opposite the inner end of Juridi; then haul sharp round the reef into the channel, heading about 76° , which is the general direction into the lagoon.

The only danger to be apprehended when entering this passage under steam is in rounding the point of the reef off the inner end of Juridi. The tidal streams are strong from the branch channels on the northern side, and if the ebb tide is running that from the first branch will assist in bringing the head of the vessel to the eastward, but that from the second branch sweeps across the channel, striking the reef on the opposite side, sets back diagonally across the passage, striking the vessels on the starboard bow just when in the narrowest part of the channel, making it a matter of some difficulty to keep clear of the reef on the port hand.

Having cleared the reef, keep well to the northward when passing the branches, as the stream setting out strikes the ship with considerable force. Pass to port of the small detached point of the inner extremity of the reef. The flood tide affects the passage in the opposite direction to the ebb, except the counter set-off at Juridi, and must be allowed for accordingly.

Sailing vessels should not attempt the passage except with a fair wind. Should they be headed off while in the channel, those in small vessels may take any of the branches, if they prefer it to anchoring. Larger vessels would be obliged to anchor at once. If there is no wind, a vessel could easily warp through at slack water. Having entered the lagoon, the navigation is simple, occasional shoal patches being clearly visible from aloft and easily avoided.

The north point of Juridi Island is in latitude $4^{\circ} 36' 33''$ N., longitude $168^{\circ} 41' 35''$ E.

Pilots.—Pilots can be procured here, and should be employed.

Anchorage in the lagoon is in 15 fathoms, sand and coral, with the southwest point of Ebon Islet bearing 222° and the north end of Juridi Islet 320° .

Supplies.—The islets are all thickly covered with coconut, pandanus, breadfruit, and other trees; bananas, taro, and a few vegetables are grown in small quantities. There is no good fresh water on the atoll. The foreigners residing here catch all the rain water they require for domestic purposes. Wood can be procured from the natives. Fowls, pigs, ducks, and fish are plentiful, and can be procured at reasonable prices. The natives here know the value of money, and generally prefer it in exchange for their produce.

Tides.—It is high water at Ebon Atoll at full and change at 4h. 45m., the rise being 6 feet.

Namorik or Baring Atoll is situated 65 miles northwest of Ebon and consists of two wooded islands 50 feet high, and having a small coral islet between them. They are situated upon a reef strewn with large black boulders, around which there is no anchorage. There is a small lagoon, but it is available for boats only at high water.

Trading stations are situated upon this island. Coconuts, bread-fruit, bananas, and taro can be obtained. The inhabitants number about 300.

The south point was found to be in latitude $5^{\circ} 35' N.$, longitude $168^{\circ} 6' E.$

Kili or Hunter Islands, in latitude $5^{\circ} 35' N.$, longitude $169^{\circ} 10' E.$, extend $2\frac{1}{2}$ miles in an east-and-west direction. They were devastated by a hurricane in 1874. Landing is rarely practicable.

The Jaluit Co. intend to plant this island with coconuts. A white man is usually stationed here and several natives.

The island is about 1 mile across, and off its southwest point a reef extends for more than a mile, on which the depths are from 5 to 15 fathoms.

Anchorage may be had here, but it is much exposed to swell and sea.

Jaluit or Bonham Atoll, situated 85 miles north-northeastward of Ebon Atoll, appear as one long low island when approaching from the southward. In consequence of the proximity of the islands to each other, the gaps in the vegetation are difficult to distinguish.

This atoll is 32 miles long north and south and 20 miles wide in the broadest part. There are about 50 islands around the edge of the reef, which incloses a large lagoon with depths of 25 to 30 fathoms.

Settlement.—This group has become the most important part of Micronesia, and several trading stations have been established. It is also the seat of the German Government in the Marshall Group.

The settlement is upon Jabur or Bonham, the island situated on the south side of the southeast passage, within which there is good anchorage.

The correct position of Jaluit Island observation pillar is latitude $5^{\circ} 55' 08'' N.$, longitude $169^{\circ} 38' 39'' E.$

Lagoon entrances.—There is a good passage upon the southeast side, a deep narrow passage through a long stretch of reef on the west side, and three good passages near each other upon the north-east side.

Directions.—The best entrance is on the southeast side, close northward of Jaluit Island. The least water in the channel is 9 fathoms. There are no known outlying dangers.

If bound to the settlement on Jaluit (Jabur) Island by Southeast Passage, it is advisable to steer northward along the reef, keeping 3 miles from the breakers until the houses and flagstaffs of the settlement are seen bearing 256° . The entrance will not be recognized until close in, the sea apparently breaking right across it.

The channel is less than 100 yards in width, and the current sets across it in a northerly direction. Near the time of springs the stream runs with great strength, want of attention to which circumstance has caused the loss of sailing vessels upon the fringing reef

of the small islands upon the northern side of the channel. An iron wreck lies here.

Buoys—Anchorage.—The shoal in the Jaluit anchorage, 450 yards, 256° of pier No. 1, which dries, is sometimes marked by a beacon. There is a mooring buoy about 80 yards eastward of the shoal, not to be depended on, convenient to secure a vessel's stern to. Near the point of the reef which stretches from observation point lies a small red buoy, with white cage topmark. A similar buoy marks a 2½ fathom patch 600 yards 211° from it.

There is anchorage in from 8 to 9 fathoms from 200 to 400 yards off the coaling pier No. 1, eastward of the shoal in the anchorage. Vessels of 16 feet draft can lie at the coaling wharf during the time of the trade wind. Two small warping buoys lie in the vicinity of the coaling pier.

Sailing vessels should not approach the Southeast Passage nearer than 1½ miles on a 256° bearing until the pilot boards.

If entering by Southwest Passage, there is anchorage in a bay about 1 mile to the southward. This entrance is broad and deep, but there is a sharp turn in it and a strong current, so that care is necessary.

Pilot.—The Government pilot will come off to vessels on the usual signal being made. Pilotage is compulsory to merchant ships.

Quarantine.—Vessels must fly the yellow flag until permitted to haul it down by the health officer.

Supplies.—Pigs and fowls may be obtained occasionally from the natives, and ships' provisions from the traders. Vessels can also be supplied with water.

Coal.—The German Government has established a coaling station here for their naval vessels, and coal can generally be procured from the trading firms.

Position.—The north point of Jaluit Island is in latitude 5° 55' 25" N., longitude 169° 38' 40" E., as determined by a German astronomer in 1904.

Elmore or **Odia Atoll** (forming part of the group named Ailinglab Lab), lying 62 miles northwest of Jaluit Island, is 30 miles long and 15 miles across in the widest part.

The lagoon inclosed by this group can be entered by five passages, the best of which, named South Pass, lying 7 miles westward of the southeast point, has nothing less than 10 fathoms in the fairway.

Approaching from the westward the passage opens out when bearing 42°. A village stands on the east side of the passage with two remarkable coconut trees much higher than the surrounding trees.

When passing between the islands and steering about 31° a reef will be seen ahead inside the lagoon; and when inside the islands

two channels present themselves, one to the eastward and the other in a 335° direction. The northwest passage is straight, about $\frac{1}{2}$ mile long, and 150 yards wide. After clearing the passage, haul to 211° , and anchor in 22 fathoms, sand and coral, off a small islet on the reef.

There is also anchorage off a large house westward of Enyebing Island in 5 fathoms.

With winds from the eastward there is anchorage outside the lagoon in from 10 to 12 fathoms sheltered by Wotja Island, the westernmost of Elmore Atoll.

There is a trading station here.

Jabwat.—This island is situated 9 miles 0° from Jih Island, the northernmost of the Elmore Islands, from which it can be seen. It is $\frac{3}{4}$ mile long by $\frac{1}{4}$ mile wide. Reefs surround the island, extending $\frac{1}{4}$ mile from the south and west sides and $\frac{3}{4}$ mile from the north and northeast sides.

There are a few inhabitants.

Namu or Musquillo Atoll, lying 28 miles 312° of the Elmore Atoll, includes a lagoon, upon the western edge of which is situated Bock Island.

There is a passage into the lagoon close south of Bock Island. There is another passage $2\frac{1}{4}$ miles 346° of Leuen, the southern island of the group. These passages are difficult for sailing vessels.

The islands Namu and Madamett, situated on the northwest extreme of the group, are sparsely covered with coconut trees. Great caution must be observed when passing to leeward of the reefs, in consequence of the easterly set, and between the months of May and September breakers are rarely seen upon the reefs on the lee side, instances being known of accidents occurring to vessels from want of attention to this fact.

Position.—The south point of Namu Islet is in latitude $8^{\circ} 14' N.$, longitude $168^{\circ} 03' E.$

Lib Island.—This island, lying 34 miles 284° of the north end of the Namu Islands, is $2\frac{1}{4}$ miles in extent in an east and west direction, with reefs extending $\frac{3}{4}$ mile from the south and east sides, $1\frac{1}{4}$ miles from the north, and about 400 yards from the west sides.

The center of the island is of lower elevation than the coast line. The soil is fertile and cultivated by a few inhabitants. There is no anchorage around the island.

The center of the island is in latitude $8^{\circ} 19' N.$, longitude $167^{\circ} 23' E.$

Kwajalong or Menschikov Atoll lies 32 miles 335° of the Namu Islands, the northwest extreme of which, or Ebadon Island, is situated in latitude $9^{\circ} 22' N.$, longitude $166^{\circ} 53' E.$ This group incloses

the largest lagoon in the Marshall Islands. Notwithstanding the extent of this ground, the inhabitants number only about 200.

With the exception of Kwajalong (the southern island) and the islands situated on the northeast of the group, known as Ailing Jappel, there are few coconut trees upon these islands, and they are visited by the natives at times only for the purpose of curing fish.

The islands on the northwest sides are almost destitute of trees.

Entrances.—There are 25 passages into the lagoon, but 6 only of these can be considered as ship channels.

South Pass, 4 miles northwest of Kwajalong, has a depth of 10 fathoms. Upon the eastern side the pass south of Bigej Island has 7 fathoms; upon the north side the pass eastward of Mella Islands (North Pass) has 10 fathoms; upon the west side the pass west of Eru Island has 9 fathoms, and is considered a good one for leaving the lagoon; the passage west of Onemak Island has 20 fathoms, and is the best when bound for Ailing Jappel.

The northern part of the lagoon is shallower than the southern.

Anchorage in the lagoon can be obtained off Kwajalong in from 15 to 7 fathoms; also westward of Meck Island, but the water here shoals suddenly. Between Gagan and Roi, anchorage may be taken up, but off Roi vessels should not anchor in less than 5 fathoms, and be prepared to leave by North Pass in the event of fresh southerly winds, which render that anchorage unsafe.

Outside the lagoon on the western side anchorage will be found off Eru Island in 7 fathoms, also off Onemak in not less than 5 fathoms; all other places are too steep.

Tide.—It is high water full and change at 4h.; springs rise $5\frac{1}{2}$ feet.

Lae Atoll.—These islands, 14 in number, lie close together upon a small reef about 6 miles in diameter, about 80 miles westward of the Kwajalong Island, and have a narrow passage into the lagoon from the westward, in which the depth is 10 feet, but vessels can anchor off the entrance in 4 fathoms. The inhabitants number about 250.

Some shoals lie about 200 yards southwest of the anchorage off Lae Island. The outer anchorage is in latitude $8^{\circ} 58' N.$, longitude $166^{\circ} 22' E.$

The atoll is reported to lie 10 miles farther west than the above position or than it is at present charted.

Ujae or Katharine Atoll is 22 miles long and 6 miles broad, lying in a northwest and southeast direction.

Ujae, the southern, and Enylamieg, the northern islands, are considered to be the finest of the Marshall Group, producing everything that can be grown upon any of the other islands.

The north point of Enylamieg is in latitude $9^{\circ} 21' N.$, longitude $165^{\circ} 36' E.$

There are two ship passages into the lagoon. North Pass, or that recommended for entering, is formed by sunken reefs situated 4 miles northward of Bock Island, upon the western side of the lagoon. This pass has from 3 to 6 fathoms water, with room to work through.

South Pass, south of Bock Island, is deep, but can only be used by sailing vessels having a fair wind. It is, however, easy to find, and is deeper than North Pass.

The eastern side of the lagoon is moderately clear of shoals, but the west side is full of dangers.

If bound for the anchorage off Ujae, it is advisable to follow the eastern reef of the lagoon about 1 mile distant, and not to approach Ujae under a depth of 5 fathoms.

The inhabitants number about 300.

This atoll is reported to lie 9 miles farther south than it is charted at present.

Wottho or Schanz Atoll, situated 41 miles north of Ujae Atoll, is 19 miles long north and south and 12 miles broad at the north end.

Most of the islands are near the north and south extremities, and there is a pass with 4 fathoms water on the west side between Ombelim and Eirek Islands, accessible for small vessels. Several rocks obstruct this passage, but they may be avoided by keeping nearer to Ombelim.

The northern pass is encumbered with rocks and should be avoided.

The anchorage is off the southwest side of Wottho Island, the northeastern island of the group. In latitude $10^{\circ} 10' N.$, and longitude $166^{\circ} 5' E.$

Rongerik.—This atoll consists of a chain of islets and sand banks situated on a coral reef of triangular shape about 40 miles in circuit. The islets are covered with stunted bushes, and afford nothing but turtles in the season. The pearl oyster is found here. There are some inhabitants.

There is a wide passage into the lagoon from the westward, and inside it appeared free from dangers.

The observation spot is in latitude $11^{\circ} 24' N.$, and longitude $167^{\circ} 35' E.$

Rongelab.—This atoll is situated on a narrow coral reef inclosing a large lagoon, about 25 miles westward of the Rongerik Islands. This atoll is about 35 miles long in a northeast and southwest direction and 13 miles broad; the eastern side, on which most of the islands are situated, forming a deep bay.

There are several passages into the lagoon. That to be preferred has 10 fathoms water between Gogan and Enybarbar Islands on the eastern side.

There are two good anchorages westward of Rongelab Island, on either side of a projecting spit of sand; also anchorage in from 6 to 9 fathoms northwestward of Rongelappelap, the southeastern of the

group. The latter-mentioned island is planted with coconuts, has a few dwellings, and there is a wide passage with depths of 9 fathoms close west of the island.

The anchorage off Rongelappelap is in latitude $11^{\circ} 16' N.$, longitude $167^{\circ} 00' E.$

Ailinginae.—This atoll, lying about 16 miles southwestward of the Rongelab Group, extends 15 miles in an east-and-west direction and is uninhabited. The lagoon is shallow and abounds with fish. The entrance is on the south side.

There are a few coconuts upon the western islands. The eastern islands are said to produce ironwood.

The easternmost island is in latitude $11^{\circ} 07' N.$, longitude $166^{\circ} 35' E.$

Bikini or Eschholtz Atoll is situated about 65 miles west of the Rongelab Islands. The north side of this atoll is submerged to a considerable depth; but at the south side there is a wide passage through the reef from 11 to 12 fathoms water.

The islands are inhabited by about 30 people.

Eniwetok or Brown Atoll is nearly circular and about 70 miles in circumference. On its north and west sides are about 30 low islands and islets covered with thick undergrowth, but destitute of trees. Engibi Island, the northernmost of the group, is in latitude $11^{\circ} 40' N.$, longitude $162^{\circ} 15' E.$ Eniwetok Atoll is reported to lie 5 miles farther south than its charted position.

The southern islet is named Eniwetok. There is a break in the southern reef just westward of it $3\frac{1}{2}$ miles long, and a passage with 8 to 10 fathoms into the lagoon. Parry Island is inhabited.

The islands of this atoll are actually higher than the other islands of the Marshall Group, in places as much as 20 feet above high water, but as they are only covered with bushes, they can not be seen at a distance of more than about 8 miles at the most.

Entrance.—Between Eniwetok Island and the one next west of it the reef is reported to be submerged, with depths of 7 to 11 fathoms over it, therefore forming the best and easiest passage into the lagoon.

There are 17 fathoms of water at the anchorage off Eniwetok and 8 to 12 fathoms off Engibi. Apart from the shoals, the general depth in the lagoon is from 20 to 30 fathoms.

The Jaluit Co. have commenced planting coconuts on the islands, especially on Eniwetok and Engibi.

Very heavy but not continual breakers have been reported extending about 5 miles northeastward from the island (Lojua) lying 5 miles eastward of Arthur Island. A sounding of 75 fathoms was obtained about 1 mile northeastward of the extremity of the breakers.

Ujelang, Arcifos, or Providence Atoll, consisting of 13 islands

and several sand cays, extends 13 miles in an east-and-west direction, and are cultivated by a European firm having a station on Ujelang, the southeast island.

There is no anchorage outside the lagoon, which may be entered by either of two passes on the south side of the group. The western pass (Hayes or Wide Pass) is the better, and has 4 fathoms in the entrance, but a shoal of $2\frac{1}{2}$ fathoms in it that must be avoided. On the west side of the passage there is an islet (Einmlap), having the appearance of two islets when seen from the eastward, and on the east side there is a smaller islet.

The eastern or narrow pass is 150 yards wide, has a depth of $2\frac{1}{2}$ fathoms, and is clear of rocks.

The lagoon is studded with coral patches, some very small, and great care is required in its navigation.

The anchorage is in from 9 to 10 fathoms, about 600 yards distant from the reef off the eastern houses on Ujelang Island, in latitude $9^{\circ} 42' N.$, longitude $161^{\circ} 01' E.$

Anchorage may be also obtained just inside the lagoon, in 13 fathoms, near the west islet. There is, however, a better anchorage 4 miles to the eastward of this, in 11 fathoms.

Wake Island was discovered in 1796. Its position was fixed by the United States exploring expedition in 1841 in latitude $19^{\circ} 10' 54'' N.$, longitude $166^{\circ} 31' 30'' E.$, and is described as a low coral island 8 feet above the sea, inclosing a lagoon well stocked with fish. There is no fresh water on the island, neither do the pandanus nor coconut trees grow there. The eastern portion of the island is covered in places with large, heavy brush probably 15 or 20 feet above high water. From appearances the island must be at times submerged or the sea makes a complete breach over it. Lying, as it does, immediately in the track of vessels from America and the Sandwich Islands to China, it is a very dangerous spot.

The island was taken possession of by the United States on January 17, 1900.



CHAPTER XV.

THE CAROLINE ISLANDS, PALAO ISLANDS, AND THE MARIANAS.

General remarks on the Caroline Islands will be found in the opening chapter. They belong to Germany.

Winds—Weather.—See Chapter I.

The Caroline Archipelago, inclusive of the Palao Islands, comprises about 48 groups, of which 43 are of low coral formation, the other 5 being basaltic and surrounded by fringing reefs. The peaks of the latter islands in some cases attain a height of from 800 to 2,800 feet above high water, their sides being covered from base to summit with trees and vegetation. These islands lie in the area between the Equator and the parallel of $10^{\circ} 15' N.$, and between the meridians of 134° and $163^{\circ} 15' E.$, but by far the larger number are scattered groups extending between the parallels of 5° and $10^{\circ} N.$, through a distance, in an east-and-west direction, of more than 1,700 miles.

The principal islands are Yap, Kusaie, and Ponape; area, about 560 square miles; population (1906) estimated at 55,479.

The following description of the archipelago begins at the eastern end, proceeding in a westerly direction, but as there has been no connected survey, great vigilance is necessary when navigating among the different islands.

Kusaie or Ualan Island (Strong Island) (lat. $5^{\circ} 22' N.$, long. $162^{\circ} 56' E.$), the easternmost of the Carolines, is a high basaltic island about 8 miles in length in a northeast and southwest direction and about 6 miles in breadth, and is fringed by a reef which on the northwest side extends in one place to the distance of a mile.

The general aspect of the island is hilly, and toward the center mountainous. In the north Mount Buache attains a height of 1,912 feet, and from its rounded top the sides slope gradually to the base. Near the center of the island is Mount Crozier (Fenkolberg), 2,155 feet in height, which is the summit of the island, and of a ridge extending in an east-and-west direction, and ranging in height from 1,400 to 2,000 feet. The detached conical peak on the northwest side of the island is named Mertens Monument and is 1,738 feet above high water.

Between Mounts Crozier and Buache a deep valley divides the island, at the extremities of which are situated the principal harbors, Chabrol, on the eastern, and Coquille Harbor, on the western side. This valley affords the only route by which the island can be crossed.

The southern part of Kusaie is surrounded by a chain of mangrove islets, connected by a reef, within which is a boat channel.

Near the center of the southern side this connection is broken and forms Port Lottin (Utwā Haven).

The whole of the island from the beach to the mountain tops, with the exception of the summit of Mount Crozier, is covered with thick and almost impassable forest, and the shores are surrounded by a broad belt of mangroves and other trees. The numerous water-courses and the richness of the vegetation attest the humidity of the climate, which, however, does not appear to be unhealthful.

On the eastern side, on Lele (Lollo) Island, where the inhabitants mostly reside, are some interesting ruins, built of enormous blocks of basaltic stone. There are also several artificial canals and canoe harbors. These ruins are stated by the natives to have been built by the former inhabitants, partly for defense and partly in honor of the dead, the large blocks of stone being brought from the main island on rafts.

Supplies.—The productions are taro, breadfruit, bananas, pine-apples, and coconuts. Fresh meat may be occasionally procured from the mission teachers.

Missions.—The population numbers about 400, the inhabitants being all Christians, and the island is the headquarters of the American mission to the group.

Chabrol Harbor (Lollo Haven), situated on the eastern side of Kusaie Island, is considered the best for large vessels, being easy of access at all times, open to the sea breeze, and well protected from the heavy southwest winds which prevail.

The entrance is about 200 yards wide between the reefs extending from Lele Island and Yepan and Palm Points, opening out to a space available for anchorage of about $\frac{1}{2}$ mile in extent, with depths of from 8 to 15 fathoms. All the reefs surrounding the anchorages are steep-to, as is also the reef, with sand bank, on the southern side within the entrance.

All these reefs are visible at low water, but, from the muddy nature of the bottom, are sometimes difficult to see at high water, especially after rain.

Lele Island (lat. $5^{\circ} 20' N.$, long. $163^{\circ} 01' E.$), forming the northern side of the harbor, is 1,600 yards in length. Its western end is low, and there are villages scattered along the shore. The eastern end is higher and terminates in D'Urville Point. The island stands on

the southern portion of a reef which extends 300 yards southeastward of it.

Supplies as before mentioned.

Good water may be obtained from a stream in the southern part of the harbor, but a hose is required for filling casks.

Anchorage may be obtained in a depth of about 14 fathoms, over mud bottom, westward of the sand bank; or off Lele Village, in about 8 fathoms water.

Directions.—Entering Chabrol Harbor, steer about 266° in mid-channel between the reefs on either side, which are steep-to, and pass northward of the detached reef with a sand bank on it, having passed southward of the reef which extends about 200 yards southward of Lele Island, steer about 320° for the anchorage off Lele Village.

The German naval vessel *Condor* (1904) anchored in about 10 fathoms water, over mud, with a house on a stone dam, which extends from the southern side of Lele Island, bearing 30° .

Tides.—It is high water, full and change, at Chabrol Harbor at 6h.; springs rise $4\frac{1}{2}$ feet.

Coquille Harbor (lat. $5^{\circ} 21' S.$, long. $162^{\circ} 56' E.$), on the western side of Kusaie, affords good anchorage in depths of from 13 to 15 fathoms, over a space about 670 yards in diameter, at the head of the harbor. The entrance is about 200 yards wide, and deep, but a good lookout should be kept for coral heads in proceeding to the anchorage. Low water is the best time for entering, when the reefs on either side are dry or easily discernible.

Port Berard, situated 1 mile southward of Coquille Harbor, is 200 yards wide by about 800 yards in length, its inner portion affording anchorage westward of Berard Island, in about 8 fathoms water.

Port Lottin (Utwā Haven), on the southern side, is small but well sheltered, and has a depth of 23 fathoms in the center of the outer port. It is easy of access for a sailing vessel with the prevailing wind. The entrance is about 300 yards wide and open to the south-southwestward.

Indiana Reef (lat. $3^{\circ} 20' N.$, long. $160^{\circ} 18' E.$), discovered in 1856 by the ship *Indiana*, is about $\frac{1}{4}$ mile in extent in a northeast and southwest direction, and in some places is almost dry. At the time of its discovery breakers were observed to the eastward and also about 3 miles to the southward. A more recent report (1902) states that this reef is several feet below water.

In 1908 the German naval vessel *Condor* passed about 3 miles eastward of the assigned position of this reef during favorable weather without observing any indications of its existence.

Pingelap or Macaskill Islands (lat. $6^{\circ} 14' N.$, long. $160^{\circ} 45' E.$) consist of two low islands and an islet, situated on a coral reef, ex-

tending $2\frac{1}{2}$ miles in a north-and-south direction and about $1\frac{1}{2}$ miles east and west, the whole inclosing a lagoon, into which there is apparently no passage; but boats may get anywhere over the reef at high water if there are no breakers.

The southernmost and largest island is Pingelap, on the southwest side of which is the principal village, where a native mission teacher is stationed. The northern island is named Tugulu (Teke). They are both well wooded with coconut trees and contain about 800 inhabitants.

Through the shore reef, off the principal village, there is a canoe channel from 3 to 6 feet wide and about 18 inches deep, its outer extremity being just in the breakers. On entering this channel canoes are seized by the natives and quickly hauled through. There is no known anchorage.

Supplies.—Fowls and ducks may be obtained here.

Currents.—During easterly winds a strong current setting northward has been experienced when southward of this island.

Mokil (Kalap) Islands (lat. $6^{\circ} 39' N.$, long. $159^{\circ} 53' E.$), low coral islands, three in number, are situated on a reef extending about $2\frac{1}{2}$ miles in a north-and-south direction and about a mile east and west, and inclosing a lagoon into which there is only a boat entrance. The islands are reported to lie 6 miles farther westward than the position given.

Mokil, the northeasternmost and largest island, is inhabited. Aura (Urak) and Ugai (Manton) Islands, to the southward and westward, respectively, of Mokil, are all covered with coconut trees.

The reef extends, on an average, from $\frac{1}{4}$ to $\frac{1}{2}$ mile from the islands, except at the northeast point, where it extends for nearly $\frac{3}{4}$ mile.

There is no known anchorage, but trading craft sometimes hang by the stern to a kedge anchor on the lee reef.

Mission.—There is an American mission station on Mokil.

Supplies.—Pigs, fowls, turtles, and taro may be procured here, but no water.

Ngatik Islands.—This group, discovered in 1773, consists of nine low islets situated on a coral reef 10 miles in length and from $\frac{1}{2}$ to $4\frac{1}{2}$ miles in greatest breadth. Ngatik, the largest island, is at the western end of the atoll, and in 1900 had a population of 240, many speaking English.

There is a passage into the lagoon on the southern side 1 mile westward of Uataluk Island. It is encumbered with shoals, but is used by schooners.

A deep passage is reported to exist in a locality about 1 mile westward of Uat, the eastern island.

Mission.—A missionary teacher is located here.

Supplies.—The islets are well wooded with coconut and breadfruit trees, and produce also sugar cane and bananas.

Anchorage.—The anchorage in from 5 to 10 fathoms water inside the lagoon near the western end is said to be good.

Seniavina Islands, consisting of Ponape, Ant or Andema, and Pakin or Pagueinema Islands, were discovered and examined in 1828; they were subsequently visited and partially surveyed.

Ponape Island.—The Ponape Group consists of one large island and several islands and islets, surrounded by a coral reef about 55 miles in circumference, and in which there are several openings, some of them leading to excellent harbors. This reef is steep-to in most places.

The outer edge of the reef extending from the northwest side of Ponape, between Jokaj Haven and Tauak Island, is reported to be situated $1\frac{1}{2}$ miles farther back, and of the reef extending $2\frac{1}{2}$ miles southward from Tauak Island, 1 mile farther eastward than charted.

Abnormal variations have been reported on Ponape Island.

The large basaltic island named Ponape is 12 miles in length in a north-and-south direction and 13 miles east and west, occupying nearly the whole of the area inclosed by the fringing reef.

About a dozen basaltic islands are more or less detached from the main island, while upon the coral reef itself are from 15 to 20 small islets, in every respect resembling those of the purely coralline groups.

Tolocolme Peak, the summit of Ponape, is 2,861 feet above high water, and several others nearly approach it in elevation, the main range of mountains continuing across the island in a northwest and southeast direction. A number of streams pour through the valleys on the southern side of the island, and during the frequent freshets they bring down quantities of earth which form flats along the shores.

On the northwest portion is a spot that is entirely flat from which the land falls rapidly toward the northwest point. This portion is a nearly perpendicular basaltic rock 1,000 feet above high water. On the southern side is an isolated and distinct mass of basalt, which seen from the eastward and westward resembles a lighthouse.

In general appearance Ponape resembles Kusaie Island, but it is larger and more populous, and, if not more fertile, at all events, affords a greater variety of products.

The two Natik Islands and the two Nalapen Lot Islands, on the south coast of Ponape Island, have been washed away, but numerous rocks, uncovered at low water, exist in their former positions.

Products.—Except on the leeward side, the whole surface of the island is densely covered with forest, and on its southern and western sides there are extensive mangrove swamps. Vegetable ivory is abundant, and some of the trees yield valuable timber. Tobacco and coffee are grown to some extent.

The inhabitants, which number about 2,000, are described as being a cheerful and intelligent people. An American mission station is established on the island.

Weather.—See Chapter I.

Bonikiti Haven (lat. $6^{\circ} 47' N.$, long. $158^{\circ} 08' E.$) is situated at the southwest end of Ponape. The entrance to the outer harbor is between Narlap, a wooded island on the western side, and Narmaur, formerly a sandy islet, has been washed away, but numerous rocks uncover at low water, the channel being about 800 yards wide; but it may be much narrower between the spits extending toward the channel from the two islands mentioned, and which have not been examined.

The narrows or entrance to the inner harbor is distant from the outer entrance 1 mile, and in the narrowest part is only 80 yards across. A sunken rock with 4 feet water over it lies in the approach to the narrows. A rock with a depth of 5 feet is situated in the narrows at about 670 yards southeastward of the 4-foot rock.

In the middle of the outer harbor the depth is 45 fathoms, decreasing toward the narrows to 10 and 15 fathoms.

The inner harbor is a snug basin where a vessel can lie as if in a dock. When inside the water deepens to 20 and 25 fathoms, and then gradually shoals toward the anchorage at the head of the basin to 7 or 8 fathoms. This basin is 1,400 yards in length and 250 yards in width in the narrowest part, and at the anchorage the space having over 5 fathoms of water is about 400 yards in diameter.

It is better not to attempt the harbor without a pilot, good natives being obtainable for the purpose. Sailing vessels should be prepared to warp through the narrows.

Supplies.—Pigs, fish, coconuts, and breadfruit are obtainable from the natives, and water from the Kapennepellap River at the head of the harbor. Boats can enter only an hour before high water. The best place for obtaining water is about $\frac{1}{2}$ mile up; just above this spot the clear water descends in a torrent.

Tides.—It is high water, full and change, at 3h.; springs rise 6 feet.

Port Mutok or Panian is on the southern side of Ponape, abreast the island of Mutok, the entrance being just eastward of Panian Island. It is very narrow and very deep, and therefore useless.

Lot Haven (lat. $6^{\circ} 45' N.$, long. $158^{\circ} 21' E.$), on the southeastern side of Ponape Island, is entered between Bonatik Point and Nanpuil (Narancpuli) Island, nearly 400 yards apart. The depths decrease from 19 fathoms at the entrance to 4 fathoms at the head of the harbor, which is a convenient one, on account of vessels being able to sail in and out with the prevailing northeast wind. There is a steam saw-mill at the village on the western side.

The entrance is through a break in the reef, and the anchorage lies between the entrance and the mangroves fronting the shore.

Port Metalanim, situated on the eastern side of Ponape, has an entrance, about 400 yards wide, through the reef northward of Narpali Islet. The anchorage is about 2 miles inside the entrance, but the channel is obstructed by three shoals, with from $\frac{1}{2}$ to $1\frac{1}{2}$ fathoms water over them, which, owing to their surface being the same color as the water, are difficult to see, even at low water and with a favorable light.

As the harbor is open to the northeast there is occasionally a heavy swell, which renders it not only difficult but dangerous for a square-rigged vessel to get out. Large vessels are recommended to moor.

The harbor may be easily recognized by Mount Takaiu, a remarkable sugar-loaf rock, situated on its northern shore.

A waterfall about 165 feet high, at the head of the port, bearing 251° , leads in, passing northward of the three shoals within the entrance.

Near this harbor there are extensive ruins.

Supplies.—Pigs, fowls, yams, and fruit can be obtained, but water is difficult to procure.

Ponape Haven, on the northern side of Ponape, to the westward of Langar Island, is confined and contains many patches of coral. The best landmark for it is a conspicuous steep peak on Jo Kaj Jekoits Island.

Port of entry.—Ponape Haven is a port of entry for the Caroline Islands.

Beacons and buoys.—In the entrance and the channel of the harbor the points of reefs and detached shoals are marked by beacons or buoys, those on the eastern side, or port hand, entering, being numbered 1 to 15 and those on the opposite side lettered A to J. The beacons, except those marking the middle ground, have no top-marks. These positions, etc., will be best seen on the plan. The beacons and buoys should not be depended on.

Langar Island (lat. $7^{\circ} 00' N.$, long. $158^{\circ} 17' E.$), about 300 yards eastward of the entrance, is about 800 yards square and has two piers belonging to the Jaluit Co. extending from its southwestern side.

A patch with a depth of 2 fathoms over it lies near the fairway at 600 yards southwestward of the southwest extreme of Langar Island, and there are several other detached shoals, for which see plan.

Supplies, except bananas and breadfruit, can only be obtained in small quantities. Beef may possibly be obtained from the trading station on Langar Island, and also from the missionaries; pigs can be procured from the natives.

Water of good quality may be procured from Pillapenchokala River. A colony was established here in 1887, on the western side of its mouth.

Pilot.—A Government pilot will board vessels outside the entrance.

Anchorage.—The anchorage southwestward of Langar Island is named Langar Road, the best position being between the extremities of the two piers, in depths of from 27 to 29 fathoms. Two mooring buoys have been established in this anchorage. Anchorage is also shown, in about 33 fathoms water, off a bight in the reef on the north-east side of Takatik Island.

The inner anchorage is situated to the eastward of Takatik Island, and here the depths are from 8 to 10 fathoms. It is recommended during the northeast trade season.

Directions.—The course through the entrance is about 136° , the reefs on both sides being clearly marked by breakers. It is advisable to keep somewhat toward the eastern side of the channel, as the current usually sets to the westward.

Tides.—It is high water, full and change, in Ponape Haven at 3h. 5m.; springs rise about $4\frac{1}{2}$ feet. There is only one tide in the day, the second rise being almost imperceptible.

Jokaj Haven, a small reef harbor, lies close westward of Ponape Haven.

Paliker Haven, about $3\frac{1}{2}$ miles westward of Jokaj Haven, is reported to be a large basin, free from shoals, and larger than Port Metalanim, with an easy entrance and channels inside the reef, which can be used by large vessels.

Inside passage.—Small steamboats can pass from Langar Road, round the western end of Ponape Island, inside the reef, nearly to Ronikiti Haven, before reaching which a shallow reef, only passable by pulling boats at high water, bars the channel.

There is also an inside passage, suitable for small steamboats, to the eastward from Langar Road to Oa Mission station, but from this place to the southward the reef is too shoal for anything but pulling boats at high water. Between Lot Haven and Ronikiti Haven pulling boats can pass at any time of tide.

Tauak Haven is an opening in the reef close southward of Tauak Island, on the western side of Ponape. There is also an opening close south of Palang Island.

Ant or Andema Islands (lat. $6^{\circ} 48' N.$, long. $157^{\circ} 57' E.$) lie about 8 miles westward of the entrance to Ronikiti Haven in Ponape. This group consists of 13 small islets and 2 larger islands.

The group consists of four low wooded coral islands, named Patya (Pacha), Nikalap Aru (Kahlap), Imwinjap (Palientopata), and Pamuk-Imwintiati (Panemuk), and several islets situated on a reef, forming a lagoon, somewhat oval in shape. There is a deep passage

into the lagoon named Tauenai by the natives, situated close westward of Nikalap Aru, the largest island.

A small island, not shown on the plan, is reported to be on the western side of the atoll, with the eastern island bearing 88° and the western point of the southern islet 172° .

The tidal stream is very strong in this passage, but trading craft occasionally enter with the stream and anchor, in 3 to 6 fathoms, abreast Nikalap Aru Island, well protected from trade wind.

The group is permanently inhabited, the natives being engaged in the manufacture of copra; others resort to it between May and September for the haw's-bill turtle fishery, which belongs to one of the Ponape chiefs. The population in 1898 consisted of about 20 families.

The channel between these islands and the Ponape Reef is 5 miles wide and clear of dangers; but sailing vessels using it are liable to be becalmed, the high land of Ponape intercepting the trade wind.

Tides.—It is high water, full and change, about 11h. Spring tides occur two days after full and change of the moon and neaps at the quadratures.

Pakin or Pagenema Islands (lat. $7^{\circ} 04' N.$, long. $157^{\circ} 50' E.$) lie 15 miles west-northwestward of Ponape. The group consists of five islands and six islets, connected by a reef forming a crescent-shaped lagoon extending about 5 miles northwest and southeast. Nikalap, the westernmost island, is inhabited by a Ponape chief and his family. There is no passage into the lagoon, but it abounds with fish.

Amicitia Island was reported in 1852 as being a low island situated about 70 miles 296° of the Pakin group. The position is doubtful, and the island may be identical with those islands. The German naval vessel *Condor* (1906) passed about 7 miles northward of this position without seeing the island.

In 1910 a search extending from about 45 miles westward to 60 miles eastward of its reported position and 12 miles north and 12 miles south showed no indications of Amicitia Island.

Reef.—A reef with low bushes on it was seen in 1880 by the mission vessel *Morning Star*. Its charted position is about 20 miles 226° of that of Amicitia Island. This reef was not seen by the German naval vessel *Cormoran* in 1913.

Oraluk Island (lat. $7^{\circ} 38' N.$, long. $155^{\circ} 17' E.$) is a lagoon reef extending in an east-and-west direction for about 20 miles by 11 miles in breadth. On the northwest extremity is San Augustin, a coral island about $\frac{3}{4}$ mile in length and with a few coconut palms on it. It is visible from a distance of 10 to 12 miles. On the southeastern end of the reef is Baxo Trista, a rock some feet above high water. The island was swamped by a tidal wave in 1898. The 14 inhabitants were saved eventually by climbing a large tree.

Keltie Pass is a deep channel on the northern side into the lagoon. There is a passage on the western side and three or more on the southern side.

The German naval vessel *Cormoran* anchored in the lagoon (1913) and reported that it is deep inside, can be entered through the Keltie Pass and Pioneer (Western) Passage, and offers large vessels good protection from rough seas. San Augustin Island is uninhabited and is a breeding place for birds. On it are the remains of some coconut trees, which are eaten up by coconut crabs and rats.

Anchorage is shown on the plan in 10 fathoms southeastward of San Augustin Island and southward of the sand bank, awash, in the northeast part of the lagoon, inside Keltie Pass.

As this neighborhood is very imperfectly known, mariners are cautioned to give it a wide berth, especially during the strength of the northeast trade winds, when the currents are very uncertain.

Minto Reef, about 60 miles west-northwestward of Oruluk, was seen by the bark *Countess of Minto* in 1842, and subsequently by several passing vessels, and is described as being 10 miles in length in an east-and-west direction and mostly level with the water. On the northern part it is 6 feet above high water and on the western edge is a sand cay. The eastern end breaks heavily at times. This reef was not seen by the *Cormoran* in 1913.

Dunkin Reef (lat. $9^{\circ} 00' N.$, long. $154^{\circ} 00' E.$) was seen in 1824 by the person whose name it bears. It may be identical with the Minto Reef, but as a report from a whaler places it about 50 miles north of that danger, it may be a separate shoal. It is reported to extend north and south for about 35 miles, and the position given is that of the south point.

This reef was not seen in 1911 by a vessel passing at a distance of 4 miles southward of its assigned position.

Matador Island (lat. $1^{\circ} 30' N.$, long. $157^{\circ} 00' E.$).—In 1876 a group of 15 small coral islands on an atoll was reported by the master of a schooner. One of the islands was inhabited; the natives were shy. The island having been unsuccessfully searched for by traders on several occasions, its existence is considered to be doubtful.

This island was not seen in 1911 by a vessel passing in clear weather at a distance of 2 miles from its assigned position.

Greenwich Islands (Kapenmailang Islands) (lat. $1^{\circ} 04' N.$, long. $154^{\circ} 45' E.$) form an atoll having 28 small islands, covered with coconut trees, all situated on the eastern side.

The reef is triangular in shape, with its base to the northeast, and is about 14 miles in extent in a north-and-south direction by 8 or 9 miles east and west, inclosing a lagoon. At the eastern extremity of the reef is a sand bank.

There is an entrance for boats on the southern side about 1 mile westward of the western island.

The inhabitants probably number about 150 (*Espiegle*, 1883).

Nukuoro Islands (lat. $3^{\circ} 52' N.$, long. $154^{\circ} 58' E.$) comprise a low atoll, about 14 miles in circumference, consisting of 46 islets situated on the northern and eastern sides of a reef.

There is a passage into the inclosed lagoon, on the southeast side, about 90 feet wide, and the natives assert that it has a depth of 7 fathoms. It lies northwest and southeast and sailing vessels find it difficult to leave the lagoon with the prevailing wind. The current sets on to the lee side of the passage and the ebb stream comes out at the rate of 6 knots. In no case should it be attempted except at low water. The entrance is dangerous for boats. There are many coral patches in the western part of the lagoon.

The village is situated on Nukuoro, the largest and easternmost islet. The inhabitants numbered 150 in 1894, and all spoke English.

The current between Nukuoro and Mortlock Islands runs at the rate of about 1 knot northwestward.

Mortlock Islands (Nomoi Islands) is the name given to three distinct groups of coral islands and reefs known, respectively, as Lukunor, Satawan, and Etal. They were examined in 1828.

Lukunor Islands are situated on a reef about 18 miles in circuit, inclosing an oval-shaped lagoon lying in a northwest and southeast direction. The islands are low and covered with breadfruit and other trees.

Lukunor Island, at the eastern angle of the group, is curved in the form of a horseshoe, having on its western side an excellent harbor. The greatest breadth of the island is about 670 yards, and toward the center it is 7 feet above high water. In this part it is well wooded, but the northern end is lower, and on it there are some arum plantations. There is no water beyond the rain collected in trenches and in the trunks of trees. Coconuts are abundant and other native fruits when in season.

The natives are hospitable. Their canoes are well constructed and are managed with skill and judgment, long voyages being undertaken in them.

Chamisso Harbor, formed by Lukunor Island at the eastern end of the lagoon, affords good anchorage in 11 fathoms water. The entrance, close to the westward of Lukunor, is about 500 yards in width, but is narrowed to a little over 200 yards by a shoal on the western side, with $2\frac{1}{2}$ fathoms water over it, the navigable part having depths of from 12 to 20 fathoms. The entrance is said to be very difficult to distinguish when coming from the westward and the eastern side of the channel should be kept.

Satawan is a somewhat oval-shaped lagoon, about 17 miles in length in a northwest and southeast direction and 8 miles in width, with two openings into it. On the reef are about 60 islets, the greater number being situated on the eastern sides. They are low, and wooded with coconut, breadfruit, and other trees.

Ta, the largest island, is 5 miles in length, and forms the southeastern end of the reef.

There is a good passage into the lagoon between Lipiapa and Aliare, two islets lying northwestward of the west extreme of Ta Island, but the tide rips sometimes give the appearance of foul ground. Anchorage will be found in a depth of 20 fathoms inside. (*Dido*, 1873.)

There are some coral patches inside the lagoon, but they may be easily seen and avoided. There is an opening also in the northwest side.

Etal Islands, lying northward of Satawan, are about 7 miles in circuit. They consist of a number of low thickly wooded islets, connected by reef and forming a lagoon, but there is no entrance to it.

The channel between the Etal and Satawan Island reefs is apparently clear of danger.

Namoluk Islands (lat. $5^{\circ} 54' N.$, long. $153^{\circ} 16' E.$) are five low coral islands named Namoluk, Lukan, Toinom, Umap, and Amas, connected by reef and forming a lagoon. The larger islands are well wooded and about 100 feet above high water (to the tops of the trees). The whole group is about 7 miles in circumference and has only a boat passage into the lagoon. The inhabitants number about 250. The position given is that of Amas Island.

Lossop Islands (lat. $6^{\circ} 52' N.$, long. $152^{\circ} 47' E.$) are situated on an atoll reef 5 miles in length in a north-and-south direction by $1\frac{1}{2}$ to $3\frac{1}{2}$ miles in breadth. Within them is a lagoon reported to be free from shoals. There is a narrow passage in the eastern reef with $3\frac{1}{2}$ fathoms water suitable for small vessels.

The German naval vessel *Condor* (1906) found that there were five passages in the western reef and sounded the two northern. The northernmost has a shoal with from 13 to 16 feet water over it in the middle, but not less than $4\frac{3}{4}$ fathoms was found in the next, or second, from north. The fourth passage from the north, which does not appear to have been examined, is stated to be probably the best, but the positions of the passages are said to be wrongly shown on the plan.

The southwesternmost passage, and the only one used by the mission vessel *Morning Star*, is about 2 miles northward of the southwesternmost islet, close to the southward of the only large sand bank upon the reef, and has a depth of $2\frac{3}{4}$ fathoms. It seems probable that this is the fourth passage above mentioned. At the eastern end

of the lagoon there is good anchorage abreast Lossop Island, in a depth of 10 fathoms.

Laol Island, eastward of Lossop Island, is charted as the largest of the group. Pis is the name of the southeasternmost island. The population is about 200.

Namo Island (lat. $6^{\circ} 56' N.$, long. $152^{\circ} 40' E.$) is a small island fringed by a reef, situated 11 miles 298° of Lossop Islands. It is considerably higher than most coral islands and affords no anchorage.

Truk or Hogolu Islands (lat. $7^{\circ} 18' N.$, long. $151^{\circ} 48' E.$).—This group, situated nearly 50 miles west-northwestward of the Lossop Islands, is composed of 10 lofty basaltic and numerous coral islands, in a lagoon about 40 miles in length and about the same in breadth, and is the largest group in the Carolines. The high islands in the lagoon vary from 10 to 15 miles in circumference and from about 100 to 1,358 feet above high water. Scores of smaller ones are found throughout the lagoon and upon the surrounding reefs and several are probably not charted.

The group is reported to be charted 8 miles to the westward of the proper position.

Royalist Islands.—Givry (Falinu), Hacq (Fararu), Lauvergne (Fanek), and South (Epis) Islands are upon a separate reef of rectangular shape forming the southern group of the Truk Islands, and are charted as the Royalist Islands. The reef is about 12 miles in length in a northwest and southeast direction by 5 miles in breadth, and surrounding a lagoon, into which there is a passage westward of Givry at the northern end, and between Lauvergne and South Island at the southern end.

The northern passage is deep westward of the central dangers, with $2\frac{1}{2}$ fathoms in the channel eastward of them. The southern passage is easy of access, keeping a good lookout for the charted dangers.

Between the two groups there is a wide, clear passage, with deep water, through which the tidal streams run strongly, the flood to the westward and the ebb to the eastward.

Main lagoon—Eastern entrances.—On the eastern side are several entrances. About 7 miles northeastward of Givry Island is Uligar Pass, with depths of 6 to 7 fathoms. Next is Neurui Pass, with 6 to 10 fathoms and 300 yards wide, in which there is a considerable swell with easterly winds. Pones Island is situated on the southern side of the pass. The *Morning Star*, missionary steamer, used this passage when leaving the lagoon.

Two and a half miles northward of Pones Island is Salat Pass, another good entrance, about 150 yards wide. It was through this passage that the *Morning Star* entered the lagoon.

Northeast Pass, about 17 miles farther north, is an excellent passage, a mile or more wide, with from 11 to 13 fathoms water. Just inside is a patch with a depth of 3 fathoms over it. This pass is reported to be 1.8 miles farther north than charted. There are tide rips in this passage during the northeast trades. At the north end of the lagoon the natives reported three more good passages, as charted.

Reefs.—Several reefs are reported to exist southward of Eten Island, between Udot Island and White Sand Island, also between Ulalu Island and White Sand Islet. Several reefs, with foul ground, lie westward of Eten Island, in the approach to Eten Harbor.

In Eten Harbor, off the southeast end of Dublon Island, is a rock, 3 feet in diameter, with 6 feet of water on it.

Western entrances.—On the western side are a large number of entrances to the lagoon too numerous to be mentioned in detail; it is also probable that there are several others which are not charted. From the southern end westward the principal entrances are, apparently, the Otta, Pispis, Ulifauro, with depths of from 7 to 10 fathoms; Piaanu, with 7 to 8 fathoms, etc.

Supplies.—Pigs and fowls may be procured in small quantities, and vegetables and fruit are also scarce.

Dangers.—The several known dangers in the lagoon will be best seen by referring to the chart. Foul ground has recently been reported between Tsis, Fefan, and Tarik Islands, and vessels should not pass between Tsis Island and a sand bank $2\frac{1}{2}$ miles west-southwestward of it, as a shoal has been reported in the locality. It is probable that several dangers exist among the group which are not charted.

Beacons.—The passage between Dublon and Eten Islands is marked by beacons, as follows: The middle reef and the outer ends of the reef near Dublon, on the north side of the fairway, by five red pole beacons with red diamond-shaped topmarks, marked A to E in white.

The outer ends of the reefs near Eten, on the south side of the fairway, by three black pole beacons with black square top marks, numbered 1 to 3 in white.

A black beacon with white circular topmark has been erected by the Jaluit Co. on the projection of the reef north of the entrance to the Eten station.

Observation spot (lat. $7^{\circ} 18' 30''$ N., long. $151^{\circ} 48' 30''$ E.).—The observation spot was on Tsis Island. The British naval vessel *Blanche* (1872) reported the longitude as $151^{\circ} 56' 30''$ E.

Local attractions.—Strong magnetic disturbances have been observed on Eten Island. These are reported to be of no practical importance to shipping.

Good anchorage can probably be found almost anywhere in the lagoon, but that off Tsis Island, in the southern part, is reported as

bad. The soundings taken in the *Morning Star* varied from 15 to 27 fathoms. That vessel anchored near the southeast end of Uman Island, in a depth of 17 fathoms. More sheltered anchorage, however, can be found in the channel between Uman and Fefan Islands, in 19 fathoms water.

There is also anchorage westward of Moen (Uola) and Doublon (Toloas) Islands, where there are trading stations, but the shoals between Fefan and Doublon Islands are said to be incorrectly charted.

There is anchorage in Eten Harbor, between Eten and Doublon Islands, in 9 to 11 fathoms, as charted.

The natives generally have some small civil war on hand, and the national game of head-hunting interferes with business. They number about 10,000. There were 30 Japanese traders (1908) in Truk Lagoon, and a Hamburg firm sends several vessels every year to fill up with copra, Yap and Truk yielding about one-half of the export from the Caroline Islands. In the lagoon there is good pearl shell.

An American missionary resides on Fefan Island.

Hall Islands, about 60 miles northward of Truk Island, consist of two groups, named Murilo and Nomwin Islands.

Murilo Islands, the eastern group, contains nine islands, the three largest being named Murilo, Ruo, and Numurus. They are low and wooded.

The reef which surrounds them is 20 miles in length in an east-and-west direction, and its greatest breadth is 9 miles. The greater portion of the lee or western half is sunken, and consequently dangerous to approach at night. The entrance to the lagoon is on the south side, immediately westward of Ruo Island. It is about $\frac{1}{2}$ mile wide, and is deep. There is supposed to be good anchorage inside.

The natives were not to be trusted (1899).

Nomwin Islands (lat. $8^{\circ} 25' N.$, long. $151^{\circ} 49' E.$), the western group, is triangular and 40 miles in circuit. On the reef are situated 14 low and wooded coral islets, the principal being Fananu and Igup on the eastern and Nomwin and Elin on the southern sides. The position given is that of Nomwin Islet.

The reef is in some places sunken and dangerous. The entrance to the lagoon is on the southeast side.

There is anchorage in the lagoon within these islands near Fananu Island. The lagoon is navigable by ships and offers good protection.

Lutke Island (Fagau Pissila), about 20 miles westward of the Hall Islands, is a low coral islet, about $\frac{1}{4}$ mile in length, and fringed by reef.

The island is inhabited and other Caroline islanders sometimes touch here for water, which is deposited by the rain in a small natural basin.

Lutke Island (Fagau Pissila) is reported to lie about 7 miles to the westward of its charted position.

Olol Islands (lat. $9^{\circ} 00' N.$, long. $150^{\circ} 14' E.$).—This group is of triangular form, with the apex to the northward and the base extending 45 miles east and west. The islets are partly connected by reef, on which the sea breaks in some places; in others it is only marked by the greenish color of the water. On the southern and western sides the reef is submerged. The islands are inhabited. The position given is that of Magur Island, the northern of the group.

Anchorage.—It is reported that good anchorage may be obtained to the eastward of Ulul Island, but, with a westerly wind, as much exposed to the sea as outside.

Decapolis Shoal.—The *Decapolis*, in May, 1869, when southward of the Olol Group, passed within $1\frac{1}{2}$ miles of a large patch of breakers; the position being given as about 12 miles southwestward of Pissaras Island.

McLaughlin Bank (lat. $9^{\circ} 12' N.$, long. $148^{\circ} 06' E.$).—Discolored water was observed by the *Gray Feather* in 1851 westward of the Olol Group. The least depth was considered to be from 4 to 5 fathoms.

Gray Feather Bank (lat. $8^{\circ} 10' N.$, long. $148^{\circ} 45' E.$) has a least known depth of 5 fathoms over it, but an extensive bank with a depth of 24 fathoms over it lies to the northeastward of this position, and it is possible that the lesser depth is on it and near its edge.

Los Martires (Pulap) (lat. $7^{\circ} 38' N.$, long. $149^{\circ} 33' E.$), also known as Tamatam, consists of four islands, each of which is surrounded by coral reef, sunken on its eastern and southwestern sides, and the two southern being on the same reef. The space inclosed by these islands is about 6 miles in length in a north-and-south direction by about 4 miles in breadth.

The northern island is named Pulap, the centrally situated one Fanadik, and the southern two Tamatam. They are all small and low and are lightly wooded. The inhabitants, numbering about 200, are apparently not to be trusted. The position given is that of Pulap Island.

Blacklock Shoal was reported from the ship *Cowiemulzie*, in 1861, when the bottom was seen distinctly, and casts of 7 fathoms were obtained on one side and 15 fathoms on the other, while some of the coral heads appeared close to the surface. It is reported to lie to the eastward of the sunken reef of Los Martires (P.D.) and to extend 3 miles in an east-and-west direction.

Hichfield Bank, about 12 miles northeastward of Pulap Island, and reported by the schooner *Queen of the Isles*, was estimated to be from 4 to 5 miles in diameter, and depths of from 11 to 13 fathoms was obtained on it, with every appearance of less water.

Enderby Islands (Polut) (lat. $7^{\circ} 22' N.$, long. $149^{\circ} 13' E.$), about 20 miles southwestward of Los Martires, consist of two small coral islands, about 70 feet above high water (possibly the tops of trees), and situated on the same reef. The western is named Alet and the eastern Polut. The fringing reef extends $5\frac{1}{2}$ miles in an east-and-west and 3 miles in a north-and-south direction, and there is a good entrance for boats on the southern side of the group. The natives were not to be trusted (1899). The position given is that of Polut Island.

Alet Island is also known as Tale and Elle; the eastern island is named Poloat.

Anchorage.—There is indifferent anchorage, in 10 fathoms, on a spit off the southern end of Polut Island. The German naval vessel *Condor* (1905) anchored here in 9 fathoms water, over coral, with the western side of Jale Island bearing 325° and the eastern side of Polut Island 37° .

Uranie Bank lies between 6 and 7 miles eastward of Polut Island and is reported to be connected with it. The master of the German brig *Susanne* reports the Uranie Bank to be more extensive than has hitherto been supposed, he having sailed for 12 miles on an 111° course over it, obtaining soundings varying from 7 to 30 fathoms, the position started from being at a distance of 7 miles 72° of Polut Island.

Enderby Bank, of coral, with a depth of 7 fathoms or less water over it, lies about 7 miles 297° from Jale Island.

Condor Bank, composed of coral, with depths of from 12 to 13 fathoms, and estimated to extend 3 miles in an east-and-west and 6 miles in a north-and-south direction, is situated nearly 70 miles westward of Jale of the Enderby Group.

Susanne Reef (lat. $7^{\circ} 07' N.$, long. $149^{\circ} 09' E.$), said to be a reef having a few black rocks above water, is reported to be on the northern end of an extensive bank which extends to the southward to Polusuk Island a distance of about 30 miles and to the westward for about 16 miles to a reef reported, in 1886, by the commander of the Spanish transport *Manila*. Depths of 12 fathoms and less water are reported on this bank and the tidal streams are said to set strongly across it, the flood to the eastward and ebb to the westward.

A reef was seen breaking near the latter position given (1886) by the British ship *John McBlair* (1891).

Pulusuk (Hok) Island, supposed to be on the southern end of the bank above mentioned, is a low coral island, nearly 2 miles in extent in a north-and-south direction, and fringed by reef. It is covered with coconut trees and has about 100 inhabitants. The natives had a bad name in 1899.

A coral bank with irregular depths of from 9 to 30 fathoms extends about 5 miles off the northwest end of the island, and is reported to terminate in a dangerous reef, the exact position of which is unknown.

A boat channel through the fringing reef is situated on the western side of this island at about $\frac{3}{4}$ mile from the northern end.

Paz Bank is reported by a vessel named *La Paz* to lie about 15 miles eastward of Pulusuk, but it is stated, on the authority of the commander of the Spanish transport *Manila*, that this bank does not exist in or near the position assigned to it on the chart.

Lady Elgin Bank (lat. $6^{\circ} 18' N.$, long. $149^{\circ} 28' E.$) was discovered by the *Lady Elgin* in 1854. From the position given a depth of 7 fathoms was carried for about $1\frac{1}{2}$ miles to the 207° , and then to the 342° , when broken water was seen to the northward.

Helene Shoal (lat. $5^{\circ} 33' N.$, long. $149^{\circ} 3' E.$).—Mr. Johnes Leveresen, master of the German bark *Helene* (1874), reports the existence of a shoal about 50 miles south-southwestward of Lady Elgin Bank. The position given is that of its western end, from which it is charted as extending about 17 miles to the eastward.

The shoal, on which the sea was breaking when seen from the *Helene*, appeared to be about 8 miles in length in an east-and-west direction and about $\frac{1}{4}$ mile in breadth.

The master of the steamer *Angers* reports (September, 1893) that about 7 miles westward of the reported position of the Helena Shoal the vessel passed over a narrow patch of shoal water, with apparently depths of 5 to 6 fathoms on it. No soundings were taken, but the bottom was distinctly visible. This shoal is probably connected with Helene Shoal, as green water was observed from the *Angers* stretching far to the eastward of the above position.

Coquille (Piglot) Island (lat. $8^{\circ} 05' N.$, long. $147^{\circ} 36' E.$) is a low, coral islet, about $\frac{1}{4}$ mile in diameter, covered with a thick undergrowth, and some coconut and other trees, and fringed by a reef, the whole being about a mile in length in a north-and-south direction. It is not inhabited.

Condor Reef, situated 12 miles 104° from Piglot Island, is an extensive patch of discolored water, on which a sounding of 11 fathoms was obtained; less water probably exists.

Oraitilipu Bank.—This bank, with a depth of 12 fathoms over it, and situated about midway between Coquille and West Faiu Islands, was seen by Torres, but was not found by Lütke. Its existence is considered doubtful.

West Faiu (lat. $8^{\circ} 03' N.$, long. $146^{\circ} 50' E.$) is a small, low, wooded island in the middle of a reef, extending about 2 miles in an east-northeast and west-southwest direction from it, the lagoon forming a small bay. The island is wooded and uninhabited.

Satawal or Tucker Island (lat. $7^{\circ} 22' N.$, long. $147^{\circ} 06' E.$) is a circular low coral islet between 2 and 3 miles in circumference, covered with coconut and other trees, and surrounded by fringing reef. The inhabitants number about 200.

Reef.—In 1909 the schooner *Tarang* passed over a reef reported to be situated about 34 miles northeastward of this island. This reef, named Tarang Reef, position doubtful, is charted 158° from the island, at the distance mentioned.

Lamotrek or Swede Islands.—This is a triangular reef, about 7 miles in length in a west-northwest and east-southeast direction, with several islets on it inclosing a lagoon. It lies about 42 miles westward of Satawal Island.

Lamotrek (lat. $7^{\circ} 27' N.$, long. $146^{\circ} 22' E.$) is the southeast and Falaite the northwest islet. The former is inhabited, and the position given is that of its southeast point.

The German naval vessel *Cormoran* entered the lagoon in 1913 by the east passage and anchored near Lamotrek Island. The lagoon is well navigable, but offers little protection from a southwest wind. A white trader of the West Caroline Co. lives on Lamotrek Island. The natives appeared to be healthy and clean. A native doctor from Yap has been a material success.

Elato.—This group consists of a reef 4 miles in length in a north-northeast and south-southwest direction, on which are some islets, the southern being named Falipi.

On the eastern side of the reef, southward of Elato, the northern island, is an entrance to the lagoon. It is about 100 yards in width, with depths of from 5 to 6 fathoms.

The British naval vessel *Sphinx*, in the month of February, 1862, entered the lagoon and anchored in 11 fathoms water, about $\frac{1}{2}$ mile southward of the west point of Elato Island, where the vessel remained for 10 days cutting wood for fuel. Water could be obtained by digging. Few natives were living on the island. The western islands are named Oletel, Kari, and Tanas.

Toas is a reef extending $1\frac{1}{2}$ miles in a northwest and southeast direction, with two islets, Toas and Ulor, on the southeastern end of it. Its northwest extreme is a little over a mile from Falipi Island. Elato and Toas lie, respectively, 5 miles westward and 8 miles west-southwestward of Lamotrek.

Olimarao, northwestward of Elato, consists of two small islets surrounded by a reef about 5 or 6 miles in circumference; Olimarao is the northeastern and Falifi the southwestern islet. They have about 200 inhabitants. Olimarao lies about 26 miles west-northwestward of Elato, and is uninhabited.

Grimes Island (lat. $9^{\circ} 14' N.$, long. $145^{\circ} 27' E.$) was reported by the ship *Jean* in 1841 to be moderately high, well wooded, and 5 or 6

miles in circumference. The position given is that reported by the German naval vessel *Cormoran*.

Faraulep (lat. $8^{\circ} 35' N.$, long. $144^{\circ} 36' E.$) is a reef about 4 miles in circumference, on which are three low wooded islets, the whole inclosing a lagoon. The position given is that of Eate, the southernmost islet, the others being named Faraulep and Pique.

Bank.—A bank of 19 fathoms was reported by the master of the schooner *Tarang* (1910) to be situated about 43 miles 102° of this island.

Earl Dalhousie Bank is charted with a depth of 19 fathoms, over coral bottom, between Olimaroa and Faraulep, and about 42 miles southeastward of the latter group.

Ifalik or Wilson Islands (lat. $7^{\circ} 15' N.$, long. $144^{\circ} 31' E.$) consist of four islets situated on the eastern and southern edges of a lagoon about 5 miles in circumference. There is a boat passage into the lagoon on the southern side, between the two southern islets.

The group is stated to be populous, but the natives are of a clamorous disposition. The position given is that of the northern end.

The northern island is named Flarik, the southeastern Flalap, and the southwestern Ella.

A shoal is reported to lie with Flarik Island bearing 223° , distant 12 miles. Twelve fathoms was the least depth obtained, but, from the green color of the water, a less depth is supposed to exist in the vicinity.

In 1885 a shoal having over it an estimated depth of 2 fathoms was reported by the master of the Swedish bark *Gamen* to lie about 9 miles 48° of Flarik Island. The shoal was reported as being circular with a diameter of about 200 yards, and is probably identical with the first mentioned. The chart shows breakers on the shoal.

Ianthe Shoal (lat. $5^{\circ} 58' N.$, long. $145^{\circ} 27' E.$) was reported in 1845 by the ship *Ianthe* of New York, which passed within one or two ship's lengths of its eastern edge. It was considered to have not more than 8 or 10 feet of water on it and to extend $\frac{1}{2}$ mile in a north-and-south direction.

Ianthe Shoal has a least depth of $4\frac{1}{2}$ fathoms over it, as at present ascertained, and is from 3 to 4 miles in extent.

Nile Shoal.—In 1860 the whaler *Nile* passed over a sunken reef, the rocks being plainly visible, situated about 30 miles 150° of Ianthe Shoal, and it is considered probable that the *Nile* and *Ianthe* passed over portions of one extensive shoal.

Wolea or Ulie Islands.—The reef on which these islands are situated is about 6 miles in length in an east-and-west direction and about 15 miles in circumference. It forms two bays, open to the southward.

There are 22 islands on the reef, which are well wooded, and produce coconuts, breadfruits, taro, bananas, etc.

Wolea or Ulie (Uleai), the northeasternmost and largest island, is of triangular form and about $\frac{1}{2}$ mile in length. The reef off its southern side is steep and sheltered, so that landing is easy. The island is well wooded and intersected in all directions by footpaths, there being several cleared spaces with isolated houses. The inhabitants, numbering about 600, are friendly.

Raur (lat. $7^{\circ} 22' N.$, long. $143^{\circ} 57' E.$), the southeastern islet, is long and narrow, with a reef extending upward of $\frac{1}{2}$ mile to the southwestward of it.

Raur Island, and Paliau Island, northward of it, are uninhabited.

A sand cay 400 yards in extent has formed on the reef situated about 2 miles 256° from the south point of Raur Island.

Anchorage.—The eastern bay or lagoon is nearly inclosed by reefs between which are two good passages. The northwest entrance has a charted depth of $2\frac{1}{2}$ fathoms between the reefs extending from Mariaon and Tagaulap Islands.

Raur Channel, between Raur and Motogozu, is $\frac{1}{2}$ mile wide, with a charted depth of not less than 12 fathoms in the fairway, but there might be less water in the approach.

The anchorage in the lagoon westward of Raur is suitable for large vessels, having depths of from 15 to 20 fathoms, and good shelter, avoiding the charted dangers.

Rock.—A rock with a depth of $1\frac{1}{2}$ fathoms is situated near the center of the northern part of East Lagoon.

Western lagoon.—**Falalis** is the southwestern Island of the group. From it the reef trends northwestward for $\frac{1}{2}$ mile, where there is a navigable opening, named West Channel, between it and Falulap, into the western lagoon. There is a patch of $3\frac{1}{2}$ fathoms charted in the fairway with 5 and 6 fathoms on either side.

From this islet the chain is continuous to Farailles, between which and Algrail Island is North Channel, another narrow opening into the western lagoon, which has not been sounded.

Iuripik or Kama Islands (lat. $6^{\circ} 40' N.$, long. $143^{\circ} 11' E.$) are two small wooded islets, the tops of the trees being about 60 feet above high water, which lie on the eastern and western extremes of a reef about 2 miles in length, inclosing a lagoon. A dry reef is charted near each islet. The position given is that of the eastern islet.

Sorol or Philip Islands (lat. $8^{\circ} 12' N.$, long. $140^{\circ} 20' E.$).—This group is formed by seven islets, which, with the surrounding reef, extend over a space about 9 miles long in a west-northwest and east-southeast direction and $2\frac{1}{2}$ miles broad. The reef on the northern side is visible at high tide; that on the southern side is always

covered. They are low, wooded, and inhabited. The position given is that of the northwest islet as reported.

The master of the British ship *Loch Eck* reports having passed to the westward and within about 6 miles of the Sorol or Philip Islands, and that the islands form a ridge extending, as nearly as could be estimated, 6 to 7 miles in a north-northwest and south-southeast direction. Many low-lying rocks were seen above water. The sea was breaking fully a mile to the northward of the northwest island, between the other islands, and to the extreme end of the southeast island as far as could be seen.

Feys or Tromelin Island (lat. $9^{\circ} 46' N.$, long. $140^{\circ} 35' E.$) is described as being $2\frac{1}{2}$ miles in circumference and as differing from most of the Caroline Groups in having neither a lagoon nor fringing reef. The formation is madreporic rock, about 40 feet above high water at its northern end. Being steep-to, there is no anchorage; on the southwest side there is least surf, and the beach is sandy; landing is difficult. It is inhabited.

Uluthi or Mackenzie Islands.—This group consists of two distinct reefs, on each of which are several islets, the whole being of considerable extent and covered with coconut trees.

The western reef contains 24 islets, and there are two or three passages into the lagoon. The schooner *Flying Fish* entered the lagoon by one of these channels, with not less than 7 fathoms water; but in a broad channel between Paguisth and Thoroilien Islands, on the western side, a shoal with a depth of $3\frac{1}{2}$ fathoms over it is reported.

The general depths in the lagoon appear to be from 18 to 20 fathoms; but several islands and reefs exist which are not shown on the Admiralty plan, so that caution is necessary.

The eastern reef has five islets on its northern side, and a shoal extends about 14 miles southeastward from them.

The two reefs are separated by a channel about 4 miles wide at its narrowest part.

Mogmog Islet (lat. $10^{\circ} 06' N.$, long. $139^{\circ} 46' E.$), on the western reef, is the chief trading place, with a considerable trade in copra. In 1899 the natives of the group were peaceable and law-abiding, and a great contrast to some of the people farther to the eastward.

Anchorage.—There is said to be anchorage off Mogmog, Sagalay, Falalep, and Faitaboule Islands of the western reef.

Hunter Reef (lat. $9^{\circ} 58' N.$, long. $138^{\circ} 23' E.$) is a narrow coral reef passed by the *Waaksamheid* in 1791. It sounded in 16 fathoms on it, and the bottom was seen very distinctly.

Yap or Uap Island differs from other islands of the Caroline Group, inasmuch as it is larger and has a different soil, being of vol-

canic origin. It was formerly the headquarters of the Spanish Government in the Caroline Islands, and is now owned by Germany.

Yap and the smaller islands of Torei and Rumong (Ronno), situated close off its north side, are surrounded by a coral reef which extends from $\frac{1}{2}$ to $1\frac{1}{2}$ miles off the prominent points except off the southern extreme, where it projects in a narrow tongue for a distance of $3\frac{1}{4}$ miles.

The reef surrounding the islands is broken by several entrances. On the reef are a number of islands, on which are coconut palms, also banks covered at high water.

Earthquake shocks occur occasionally at Yap.

The group, with its reef, measures 15 miles in a northeast and southwest direction by about $4\frac{1}{2}$ miles in breadth, tapering to the southward.

The northern half of Yap is traversed by a ridge of hills attaining a height of about 1,050 feet above high water, and its shores are deeply indented. The southern portion, however, is flat and covered with undergrowth, above which rise numerous coconut palms.

Villages.—The villages have comfortable houses, the streets are paved with small stones, and there are also stone wharves and piers. The canoes used by the natives are carefully constructed and ornamented with carving and shells. The population is 6,358 and decreasing; there are 43 whites.

Products.—The fruits of the soil are sweet potatoes, yams, taro, papaw, pineapples, melons, bananas, sugar cane, breadfruit, etc. Copra (coconut kernel) is sun dried, and largely exported through the traders. The principal timber is the voi, which resembles mahogany. The groves of bamboo, croton, coconut, and areca palms were very fine (1899).

There are English and German factories on the islands in the bay, dealing chiefly in copra.

Tomil Haven is a good reef harbor on the southeast side of Yap, the entrance, which is through the reef, being about 200 yards wide and easily made out from aloft. Within the channel widens and affords perfectly safe anchorage with good holding ground in depths of from 12 to 20 fathoms abreast the factories.

Yap Island is the seat of government of the western Caroline Islands. The governor's house is situated on Blelatsch Island, which is connected with the main island by a causeway. The cable station consists of several large white houses with dark roofs, near which is a windmill, all conspicuous from seaward.

The windmill (wind motor) has been partly destroyed by a storm, the dome with the vanes having been blown down. Its visibility is considerably decreased. It will not be repaired.

The red roof of a house situated on an elevation above the settlement is a very useful mark for vessels coming from the eastward.

There are numerous fish weirs in the harbor; traps of stone near high wooden fences.

Position.—The observation spot on Engnoth (Donitsch) Island is considered to be in latitude $9^{\circ} 30' 37''$ N., longitude $138^{\circ} 10' 12''$ E.

Port of entry.—Tomil Haven is a port of entry for the western Caroline Islands. There are no customs duties.

Communication.—The mail steamer from Sydney to Hongkong calls every three months and returns from the latter place one month afterwards, and Japanese schooners also visit the port.

A submarine telegraph cable connects Yap with Hongkong via Guam and Manila, and there is one to Menado, Celebes Islands; it is also proposed to connect Yap and Simpson Harbor.

Coal and supplies.—A stock of Australian and New Zealand coal is kept for the German Navy, and other vessels can be supplied. The coal wharf at Tarrang Island has deep water alongside, and, by using staging, a vessel of 4,600 tons has been coaled at it. Fresh provisions are not plentiful, but other stores can be obtained and drinking water at the coal wharf.

Hospital.—A hospital is situated 1,600 yards northward of the settlement, at a place where the cliffs rise steeply to 33 feet above the water.

Landing.—There are several good boat landings alongside stone piers, with a depth of about 3 feet at low water. There is also a landing in front and in rear of the governor's house.

Pilots.—There are no pilots.

For a large ship, before going to Tarrang Island, it is advisable to seek advice from the agent of the West Caroline Co., who has local knowledge.

Chronometers may be compared, there being telegraphic connection with the observatory at Zikawei, near Shanghai.

Dangers.—Entrance Rock (lat. $9^{\circ} 29'$ N., long. $138^{\circ} 05'$ E.), 5 feet above high water, standing on the reef forming the western side of the entrance, is a very conspicuous object (painted white), especially when approaching from the eastward. Shallow water extends fully 400 yards eastward of Entrance Rock. On the eastern side a shoal, with depths of from $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms over it, extends about 200 yards southwestward of the eastern reef point of the entrance. The water is reported to have shoaled southwestward of the western entrance point of the reef.

The water inside the harbor, especially after rain, is a little turbid.

Beacons and buoys.—A beacon with a triangular topmark surmounts a conspicuous tree on one of the Burra Hills, 492 feet above high water.

Entrance Rock is marked by a beacon with white quadrangular topmark.

The extremity of the shallow water on the western side of the entrance is marked by a black can buoy, surmounted by a diamond topmark.

The western edge of the shoal on the east side of entrance is marked by a red conical buoy with diamond topmark.

Within the harbor the points of the reefs are marked by beacons; those on the port hand entering being surmounted by quadrangular skeleton cages, painted black, and those on the starboard hand by oval basket cages, painted red. The beacons are numbered, odd numbers on the starboard hand entering and even numbers on the port.

The beacon No. 35, on a detached shoal southward of Tarrang Island, is painted black and red and has two balls as a topmark and may be left on either hand.

A red warping buoy lies near the middle of the harbor westward of Tarrang, and two others are on the reef to the southward of that island.

Anchorage.—The most convenient anchorage is in the middle of the basin situated between Engnoth and Obi Islands, where the depths are from 13 to 19 fathoms and the holding ground said to be good. A space where anchorage is prohibited, about 1,200 yards within the entrance, is shown on the plan. The northern portion of the harbor is tortuous and not suitable for vessels.

To prevent damage to the telegraph cable in the harbor ships must anchor between the harbor entrance and the line Yap settlement Blelatsch-Donitsch only in the positions directed by the harbor officials.

Directions.—For a steamer there is no difficulty in entering with the sun in a favorable position and the assistance of the beacons and buoys. A pilot is obtainable, and a sailing vessel should not enter without one.

A windmill in line with the beacon which surmounts the conspicuous tree on Burra Hills bearing about 334° leads to the entrance, and the outlines of the reefs on either side are clearly defined. The current sets to the westward across the entrance, especially during the season of the northeast trades, so care is necessary, and the vessel should be kept somewhat toward the eastern side of the channel. Vessels off the port at night should be careful not to be set to the westward by this current.

Tides.—It is high water, full and change, at Tomil Haven at 7h. 15m.; springs rise about 4½ feet.

Typhoon.—A typhoon occurred here on February 20, 1895, causing considerable damage in the harbor, more than two-thirds of the houses and many thousands of trees being blown down. The wind commenced from north, with squalls from northwest, gradually in-

creasing in strength, and after some time suddenly shifted to south-east.

Storm signals.—The following typhoon signals will be made on the flagstaff of the district office at Blelatsch:

Signal.	Signification.
One red ball-----	Weather observation has ascertained a typhoon; no immediate danger.
One black lath quadrangle-----	Typhoon danger for Yap also.
Pendant D of the international signal book, blue with white ball-----	Danger past.

Current.—The German naval vessel *Planet*, on the voyage from Matupi to Yap, in January, 1912, found equatorial counter current between 5° and 7° north latitude, while on nearing Yap, at about 80 miles distance, a very strong (up to 3 miles) west current was observed. With uncertain position caution is recommended on approaching the Yap Islands.

The current off Tomil Haven was observed on four days, during which the wind was mostly from western directions, force 1 to 2. At 25 out of 43 observations the stream set nearly with the wind, with a strength up to $\frac{1}{2}$ mile per hour, and with westerly winds generally eastward, with few exceptions. The other observations showed the current setting in very different directions.

Winds and weather.—Yap has generally a moderate tropical sea climate. From the end of November to the beginning of May the northeast trade wind blows; in the remaining months unsteady winds prevail. Typhoons occur occasionally.

Rain.—The wettest part of the year is from June to November, when 62 per cent of the year's total fall occurs, viz, 79 $\frac{1}{2}$ out of 128 inches. From December, 1908, to March, 1909, was very dry.

Ngulu Islands (lat. 8° 17' N., long. 137° 32' E.) are five in number and connected by reef. The position given is that of Ngulu, the southernmost island, which is inhabited and has on it some coconut palms. The islands have only a small population and are of no importance.

The two largest, which are 3 miles apart, are on the southern edge of the reef, and 7 miles to the northwestward is another conspicuous islet.

North Island is low and covered with coconut palms, the tops being about 100 feet above high water. A reef extends northeastward of the group for a distance of about 3 miles. Between them and the southern islets the reef is in detached patches and does not break during westerly winds.

The German naval vessel *Condor* visited these islands in 1905 and found that the surrounding reef is not connected, but has several broad and deep passages, apparently suitable for large vessels. The

vessel appears to have entered by a passage to the southward, but on leaving used one to the westward, which was preferable, being broader and deeper. It was also found that the group is at present incorrectly charted, the reef stretching about 7 miles farther westward.

This group is dangerous and should be given a wide berth at night or in thick weather, as strong currents often prevail in the vicinity, and the extent of the eastern side of the reef is unknown.

Palao or Pelew Group.—This group appears, like Yap Island, to be of volcanic origin. It consists of six large islands, which, reckoning from the southward, are named Angaur, Pililu, Eil Malk, Urukdsapel (Uruktapel), Korrör, and Babelthuab, with numerous islets, these latter sometimes rising perpendicularly to a height of 600 feet above high water.

Babelthuab is equal in area to all remaining islands united.

The whole of this group, with the exception of Angaur, is situated on and surrounded by coral reefs, which extend about 55 miles in a north-northeast and south-southwest direction, by about 20 miles in breadth.

Pilot.—The head chief of Korrör is an able pilot.

Port of entry.—Korrör Harbor is the port of entry for the Palao Islands.

Population—Produce.—The inhabitants number about 3,000, and all the natives of the group are said to be quite friendly and well disposed to Europeans.

Their language is the harshest and most impossible of all the Malayan dialects.

The principal products are turtle shell, copra, and bêche-de-mer. There is good timber on Babelthuab, and goats are plentiful.

Supplies.—Bullocks, pigs, fowls, fruit, and taro can be procured at Korrör with the usual articles of barter. Excellent water can be obtained on the east side of Malakal Island.

Current.—Between the Palao Group and Yap Island the current, setting in a west-northwest direction, sometimes attains a velocity of $1\frac{1}{2}$ knots an hour, and to the southward, between the same group and Mapia Island on the parallel of Sonsol and Warren Hastings Islands, sets of 47 and 57 miles to the east-southeastward, in 24 hours, have been experienced.

Angaur (lat. $6^{\circ} 52' N.$, long. $134^{\circ} 12' E.$), the southernmost island of the group, is about 5 miles in length in a north-northeast and south-southwest direction, being broader at the northern than at the southern end. The island is of coral, with phosphate deposits, and well wooded.

A channel about $4\frac{1}{2}$ miles wide separates Angaur from Pililu, and has two detached coral reefs charted in the middle. A reef extends from the southern point of the island.

A bank with depths of 9 to 16 fathoms lies nearly in mid-channel; from the shoalest spot the northern extreme of Angaur bears 268° $3\frac{1}{4}$ miles.

Dangers have been reported to extend for a distance of about 2 miles southward and westward of the south point of Angaur; caution is therefore necessary in navigating in this little-known locality.

Anguar Island, the southernmost of the Palao Group, is in latitude $6^{\circ} 52' 00''$ north, longitude $134^{\circ} 12' 00''$ east. The island is of coral, with phosphate deposits which is mined by the South Sea Phosphate Co. It is well covered with trees and is visible for at least 10 miles. There is a reef extending southward and westward for about 2 miles, and is marked by discolored water and breakers, otherwise the coast is clear and can be approached quite closely.

The port of entry is Korrer, and in bad weather vessels often go there for shelter.

There are no stores, live stock, or water, so it is necessary for all vessels to be well stocked when visiting this island.

There are two loading berths at present, one on the northeast and the other on the western side of the island. There are two mooring buoys off the western side and one off the northeast side. Vessels make fast to one of these buoys, which are moored in 100 fathoms and keep steam up ready for slipping should the wind freshen. The average rate of loading is 500 tons per day if the weather is favorable.

Should the wind be strong from the southwest or west-northwest, vessels approaching the island will keep well out in the bay and await orders from the signal station, or proceed to the northeast buoy, where there is also a signal station and loading bridge.

Vessels have to obtain pratique, and a bill of health is necessary from the last port of departure.

In addition to coal required for the passage or voyage, vessels should have at least 250 tons extra for cruising and lying under steam.

If a vessel should have any cargo to discharge, it will facilitate and save time if it is stowed in two holds.

The offices of the colony and the company are situated on the western side of the island.

A radio station has been installed on Angaur Island. It is open to the public from 8 to 9 a. m. and from 2 to 3 p. m. (Yap time). The call letters are K.A.N. It is only visible from the eastern side of the island.

A channel about $4\frac{1}{2}$ miles wide separates Angaur from Pililu and has two detached coral reefs charted in the middle.

Currents.—The currents around Angaur are very irregular, and in the channel between it and Pililu at spring tides it sets to the eastward at 3 to 4 knots.

Pililu, the next island to the northward, lies at the southern extremity of the reef which surrounds the group on the western side. It is low, fertile, and wooded, and has a few inhabitants. The part of the reef immediately northward and northeastward of it is nearly dry at low water, with numerous islets situated on it.

Eil Malk, the next considerable island to the northward, is rocky and wooded. The reef fronting it to the eastward forms, with that off Urukdsapel Island, an excellent port, which has two entrances, one from the eastward and another from the westward. The eastern has charted depths of from 7 to 10 fathoms, but it is reported to be narrow and little known. There are said to be two passages across the reef in the western approach, which may be preferable. Endeavor Passage is closed.

Schonian Harbor, off the southwest coast of Eil Malk, has depths of 10 to 21 fathoms, over corral, yellow sand, and marl. Two shoals of $1\frac{3}{4}$ and $2\frac{1}{2}$ fathoms, respectively, lie in the south part of the harbor, and near the entrance there is a patch of 16 feet; west of it there are two dangerous reefs, with only 2 fathoms on them. The harbor is marked by beacons.

Denges Passage leads from the eastward into Schonian Harbor. The depths in it are from $7\frac{1}{2}$ to 22 fathoms. In the western part there are two shoal places, one with $3\frac{1}{4}$ and the other with $3\frac{3}{4}$ fathoms.

Beacons.—Two thin white leading beacons, with triangular top-marks, difficult to distinguish, stand on the north side, and mark the approach. In line bearing 340° , they lead into Denges Passage. At the western end of the passage, where it narrows, a beacon stands on the northern reef.

Sar Passage lies between the coast reefs of Ailmalk (Eil Malk) and Urukdsapel Islands. The small island Ngaianges in this passage may be passed on both sides.

Kreis Reef lies east of Sar Passage. There is a bare sand islet on the northwest corner of the reef.

Urukdsapel (Uruktapel) is the largest island southward of Korrör. At about 2 miles off its western point is Aulong Island, where the crew of the *Antelope* (wrecked in 1783) resided.

It is moderately elevated, rocky, and barren, but covered with wood. The eastern shore is bold, and from its high eastern bluff patches of reef extend to the southward and are also reported to extend farther eastward than charted.

Anchorage.—There are several openings and channels in the reef in the vicinity of Urukdsapel and Korrör Islands. Denges and Eil Malk Passages are said to be good and clear of hidden dangers, but

care must be exercised in navigating the lagoon between them and Aulong Island. From that island to Malakal Harbor, mentioned below, the lagoon is practically clear of danger.

Gorror (Korror) Road—Reefs.—Stephan Reef, with $2\frac{1}{2}$ fathoms on it, lies on the southwest side of Gorror Road, nearly $1\frac{1}{4}$ miles 89° from Ngaremediu, the south end of the eastern bluff of Urukdaipel. Mutomdu Reef, with $3\frac{1}{4}$ fathoms, lies 2 miles 41° from Stephan Reef and 1,800 yards southwestward of the western extreme of Augulpelu Reef. A patch of $4\frac{3}{4}$ fathoms lies about $1\frac{1}{4}$ miles northeastward of Stephan Reef, with Malakal Peak bearing 334° . The general depths in Gorror Road are from 7 to 20 fathoms, the former depth being near the $4\frac{3}{4}$ -fathom patch. A vessel may anchor in Gorror (Korror) Road in 11 to 17 fathoms, with Malakal Peak bearing 335° and Ngaremediu 238° , where she will have room to weigh with any wind.

Korror Island, though small, is the most important of the group, being the seat of government. The King claims sovereignty over the whole group. Korror Harbor, northwestward of Korror Island, affords anchorage in a depth of about 17 fathoms off the wharf.

Oluksakel, a long, narrow, rocky island, lies close to the southern side of Korror, and three others near its west point. The southern of these is Malakal. It has a tolerably high peak, by which it can be distinguished from outside the reef.

Malakal Harbor (lat. $7^\circ 19' N.$, long. $134^\circ 32' E.$) is the anchorage situated northeastward of Urukdsapel Island and the southern entrance to this harbor from Korror Road is through Kasebogau Passage, an opening in Ngadarak Reef, which extends from Urukdsapel to Oluksakel. This opening is about 100 yards wide, about $2\frac{1}{2}$ miles in length from its entrance to the anchorage, with depths of 11 to 17 fathoms in it, which is reduced to 5 fathoms northward of Channel Point, where it deepens again. (The northern entrance is referred to above under anchorages and on succeeding page.)

Beacons.—Kaseboga Passage is marked on the port side by beacons with quadrangular skeleton topmarks and painted black. On the starboard side the beacons are surmounted by baskets and are painted red. The beacons are not always on the extremities of reefs, and between the third and fourth of the starboard beacons the reef projects. A good light is necessary when passing through.

A patch with a depth of 2 fathoms over it is marked by a wooden cross with a red flag, and should be passed to starboard.

Beacons have been erected on the ends of the reefs extending southward and southeastward from Malakal Island, and also on several rocks in the harbor. Close eastward of No. 3 beacon is a shoal of $1\frac{1}{4}$ fathoms, and at 200 yards south-southeast from the same beacon is a shoal marked by a red beacon.

A tripod beacon, 20 feet high, with white oval topmark about 10 feet high by $5\frac{1}{2}$ feet broad, has been erected on Black Rock, south end of Augulpelu (Augulpolu) Reef, in front of the entrance to Malakal Harbor.

Directions.—Coming from the northeastward, steer about 250° along the southeastern side of Augulpolu Reef, which is easily distinguished by continuous breakers and when some gray and white spots on the shore of Urukdsapel bear 295° steer for them, which leads clear of a sunken reef in Korrör Roads. When the Kasebogau Passage beacons are seen, bring them to bear 317° and steer for them, leaving the outermost on the starboard hand. The tidal streams are sometimes strong in the passage.

Having passed through Kasebogau Passage and when off Channel Point, and also when passing the reef to the northeastward of it, vessels should keep on the eastern side of the channel. This part has the deepest water, the reef being steep-to, whereas on the western side the reef is shelving. Leaving Malakal Harbor by this channel at half flood, $5\frac{1}{2}$ fathoms was the least depth obtained.

The patch situated 800 yards 36° from Channel Point has not more than 3 fathoms water over it.

The northern entrance has not been described; see the chart. The Kavesak, Woodin, and Aremanalungi Passages lead to it from the northward.

There is said to be a fairly good passage from Malakal Harbor to what is known as New Harbor, northward of Korrör Island.

Anchorage.—Good anchorage may be obtained in 19 fathoms water, over sand, with Malakal Peak bearing about 340° , the north point of Urukdsapel 295° , and Channel Point bearing 182° .

Tides.—It is high water, full and change, about 8h.; springs rise from 6 to 7 feet.

Tidal streams.—In the narrow part of the channel southeastward of Channel Point the tidal streams set directly through, and outside it they attain considerable strength. The ebb stream was found running fully 3 knots an hour five days after new moon, and caused a considerable race for some distance off the entrance. To the northeastward of Channel Point the streams set across the channel.

Babelthuab, the largest island of the group, is about 17 miles in length in a north-and-south direction. On its western side is Mount Aremanalungi, 1,968 feet above high water, from the summit of which Capt. McCluer (1793) saw both extremes of the chain of islands. Several small islands are situated off the southern point of Babelthuab.

A barrier reef, which extends about $2\frac{1}{2}$ miles from the shore, fronts the eastern side of Babelthuab, commencing off the southeast

point of the island, and terminating about 2 miles southward of Molegojok, where there is a mission station. Two passages are charted through this reef on its eastern side, the southern being a boat passage, and Ngatpach Passage, the northern, having about $3\frac{1}{2}$ fathoms water.

Northward of Molegojok a reef apparently fringes the coast to the northern point of the island, being from 1 to $1\frac{1}{2}$ miles distant from the shore. From the northern point of Arekalong Peninsula it extends for about 8 miles in a northerly direction.

Inside passage.—The British naval vessel *Espiègle* passed inside the barrier reef, along the eastern coast of Babelthaub, and anchored off Enkassar and Molegojok villages, near the northeast extreme of the island.

Molegojok (lat. $7^{\circ} 30' N.$, long. $134^{\circ} 45' E.$) may be easily recognized by a long stone pier extending nearly to the edge of the reef. Enkassar is about 2 miles southward of Molegojok.

The reefs are but little known, and the patches inside them are numerous, making the navigation in some places intricate. Some of these patches being incredibly small, a vigilant lookout aloft is absolutely necessary.

Another reef, broken in places, lies almost parallel to the reef that stretches for a distance of about 8 miles northward of Arekalong Peninsula. Between them is Kavesak Passage, said to be the best entrance into the lagoon which is formed by the barrier reef to the westward of the islands.

Kavesak Passage.—It is advisable to make Kavesak Passage from the eastward, as the reefs to the northwestward of Babelthuab Island are incorrectly charted.

A reef with $2\frac{1}{2}$ fathoms on it lies about $\frac{3}{4}$ mile 238° from Ngaregal Island in the approach to Malakal from the northward, on the west side of the track recommended.

From Kavesak Passage there is a good and safe channel along the western coast of Babelthuab Island to Malakal Harbor, but a good light is necessary to see the patches, and masthead pilotage is necessary.

Aremanalungi Passage is an excellent one for entering or leaving the lagoon on the western side, but southward of this no passages are available for a vessel through the western barrier reef, as Endeavor Passage and two others to the southward of it are reported to be closed by the growth of coral and by stones and sand thrown in by gales.

Anchorage.—Anchorage is charted in from 10 to 20 fathoms water northward of the entrance to Kavesak Passage. There is also anchorage off the trading station northward of Ngarekur Island.

Armijtoakl Passage, the channel between Babelthuab and Korr Islands, is $\frac{3}{4}$ mile wide and navigable from the sea around the eastern and northern sides of Korr to the King's village, near the western point. This channel has from 10 to 25 fathoms water in it, but on account of the numerous coral patches it should not be attempted by a stranger.

Alngot Passage, the northern approach to it, lies southward of the barrier reef off the east coast of Babelthuab Island.

Kajangle Islets (lat. $8^{\circ} 03' N.$, long. $134^{\circ} 39' E.$) consist of four low islets surrounded by a reef. The largest is about $1\frac{1}{4}$ miles long in a north-and-south direction. They lie about 25 miles northward of Arekalong Peninsula.

Reefs reported.—A series of reefs, the depths over which are not stated, are reported to extend 30 miles northward from the northern Kajangle Islet.

A reef, with a depth of 5 fathoms over it, is reported to exist about 1 mile eastward of the northern Kajangle Islet.

Kossol Reef, between Kajangle Islets and Babelthuab, is a reef with sand cays extending in a north-northeast and south-southwest direction for about 7 miles.

Rocks awash and heavy breakers exist about 6 miles westward of the southern end of Kossol Reef.

Between Kossol Reef and Babelthuab Island there are irregular depths of 10 to 20 fathoms over a bottom of sand and coral.

Anchorage is shown on both sides and southward of Kossol Reef.

Ngaruagl Reef.—Besides the reefs immediately connected with the Palao Islands there is another large reef or bank stretching far to the northward of the group. It was formerly supposed to be very extensive, having been reported to extend as far as $8^{\circ} 45' N.$ and thence to the westward farther than the eye could reach. This is confirmed by the reported reefs below mentioned.

Ngaruagl Reef proper is of triangular shape and about 6 miles in circumference.

Ngaruagl Reef is reported to lie about 7 miles farther east than charted. On the south end of the reef there is a fairly extensive sand bank and on the north end are four large rocks.

Velasco Reef (lat. $8^{\circ} 28' N.$, long. $134^{\circ} 43' E.$).—The Spanish naval vessel *Velasco* in 1895 obtained soundings of 4 to 11 fathoms about 50 miles northward of Babelthuab Island on the eastern edge of a shoal extending apparently about 8 miles northward, some distance southward, and 5 to 6 miles westward of that position. The German naval vessel *Condor* reported (1906) that the position given is a correct one and that with a ground swell there is always a slight break on the reefs.

The master of the German bark *Osterbek* (1898) reported that he passed over an extensive coral shoal, with depths of 8 fathoms over it, about 9 miles west-northwest of the position of Velasco Reef. Steering 340° about $2\frac{1}{2}$ miles from that position he ran into deep water, and after continuing that course about $5\frac{1}{2}$ miles farther ran over a small reef, also with 8 fathoms.

Caution is necessary when navigating in the neighborhood of the above reefs.

Lord North or Nevil Island (lat. $3^{\circ} 02' N.$, long. $131^{\circ} 05' E.$), about 200 miles north-northwestward of the Cape of Good Hope, was seen by the ship *Lord North* in 1781. It is about $1\frac{1}{2}$ miles in length east-southeast and west-northwest, covered with coconut trees, and has a reef projecting about $\frac{1}{2}$ mile from its extremes. There are several beaches around the island, with numbers of small rocks scattered about, on which the sea breaks. It should be visible from a distance of about 12 miles.

The island is inhabited, but the people should not be trusted. The British naval vessel *Pallas* (1894) stopped about 2 miles off the island and reports that great numbers of natives came off in their canoes, bringing coconuts, shells, etc. They were wild and fierce looking and on no account should be allowed on board a vessel unprepared for attack. Report from the British naval vessel *Pallas* (1894) places the Lord North Island in longitude $131^{\circ} 11' E.$

Lord North Island, Helen Reef, Current Island, Warren Hastings Island, and Sonsol Island have been annexed by Germany and become a part of the Caroline Islands.

Helen Reef (lat. $2^{\circ} 58' N.$, long. $131^{\circ} 50' E.$), about 45 miles eastward of Lord North Island, was discovered by the ship *Helen* in 1794, but it has been described by the master of the *Cordelia Berian*, who who visited it in 1858 to recover the cargo of the tea ship *Lady Raglin*, wrecked on its western side.

The reef is about 17 miles in length in a north-northeast and south-southwest direction and nearly 10 miles in breadth across its center, and its interior is a lagoon of deep water, encircled by a narrow belt of coral heads, against which the sea breaks heavily. At the southeastern part shallow water appeared to extend $\frac{1}{2}$ mile outside the breakers and with a narrow opening into the lagoon. A rock with 2 or 3 fathoms water over it lies about $\frac{3}{4}$ mile northward of the western extreme of the reef.

The *Cordelia Berian* remained in this vicinity, under sail, for 38 days, being unable to find anchorage.

At 10.30 p. m. on February 16, 1889, the British bark *Transit* struck on a reef and afterwards foundered in latitude $2^{\circ} 49' N.$, longitude $132^{\circ} 30' E.$, but as no evidence exists to form an independent estimate of this position, and in view of the fact that the vessel was 39 days

out from Singapore, and that 10 days had elapsed since the land near Gillolo had been lost sight of, it is not improbable that this danger may be identical with Helen Reef.

Tides.—The tidal stream runs strongly over Helen Reef, the flood to the eastward, the ebb to the westward. The currents in the vicinity are stronger and irregular.

Current Island (Pulo Island) (lat. $4^{\circ} 38' N.$, long. $132^{\circ} 02' E.$) is about $\frac{1}{2}$ mile in extent, low, thickly wooded, and inhabited. It should be visible at a distance of about 12 miles, but the position given is approximate. A reef is said to project 1 mile from its northern and southern sides. See remarks on natives of Lord North Island on preceding page.

The British naval vessel *Pallas* in 1894 visited the island, but failed to find anchorage anywhere. There was no bottom at 150 fathoms 400 yards from the beach.

Warren Hastings Island (Merir Island) (lat. $4^{\circ} 18' N.$, long. $132^{\circ} 21' E.$) was discovered in 1761. It is about $1\frac{1}{4}$ miles in length in a north-and-south direction, nearly 1 mile in breadth, and covered with trees, which are visible from a distance of about 12 miles. A reef encircles the island, extending about $\frac{1}{2}$ mile from its northern and southern ends, where it breaks. On the western side there is a smooth beach.

A native came off in a canoe who could speak a little English, learned at Yap. The village is apparently at the northern end, where there are a few coconut trees. The natives have nothing to trade, and are very wild in appearance and manner. The position given is the center of the island, but according to observations in the British naval vessel *Pallas* the longitude is $132^{\circ} 21' E.$

Sonsol Islands (la. $5^{\circ} 20' N.$, long. $132^{\circ} 16' E.$) were discovered by Padilla in 1710. They are two in number and surrounded by a reef, which is steep-to, extending but a short distance from the islands. The channel between the islands is reported to be clear, with strong tidal streams in it. The largest island is less than $\frac{1}{2}$ mile in a south-southwest direction from the other. They are small, low, and thickly wooded, the tops of the trees being visible from a distance of about 12 miles. The position given is approximate.

There are some inhabitants on the islands, and these occasionally visit the Palao Group in their canoes. There appears to be no anchorage.

Reported breakers (lat. $4^{\circ} 18' N.$, long. $136^{\circ} 21' E.$).—The master of the bark *Quickstep*, of New York, reports that on a passage from Batavia to Manila, on the afternoon of February 15, 1877, he saw what appeared to be a shoal, the sea breaking over it in white foam, extending east-northeast and west-southwest for about $1\frac{1}{4}$ miles, and apparently about 250 yards wide.

The position assigned to these breakers was as carried forward from the noon position.

The above position must, however, be considered doubtful, as the British naval vessel *Espiègle* in 1883 passed over it and observed no indications of shallow water, neither could any bottom be obtained with 50 fathoms of line. It might have been a shoal of fish.

The coast and islands westward of the Cape of Good Hope are described in British Admiralty publication Eastern Archipelago, Part I.

The Marianas or Ladrone Islands.—The general remarks on these islands, with the winds, climate, etc., will be found in Chapter I.

The currents in the vicinity of the Marianas are variable and much affected by the wind. Usually for nine months of the year, October to June, the drift to the southwest caused by the northeast trade sets past the islands at a rate of from 1 to 2 knots. From July to September the main drift is to the northeast.

Tides.—The rise of tide in the archipelago is generally less than 3 feet.

Guam or Guajan (lat. 13° 26' N., long. 144° 43' E.), the southernmost, largest, and most populous island of the Mariana Group, was ceded by Spain to the United States in 1898. The island is fringed throughout a great part of its circuit by a reef which dries in places.

At a distance this island appears flat and even. Its eastern side is bordered with steep cliffs and exposed to the ocean swell. The northern side of the island is rather low, the small hills of Santa Rosa (about 870 feet above high water) being the only elevation, but to the southward it is more mountainous, Mount Tinkio forming several peaks of about 1,000 feet, and others near the southern end about 1,200 feet above high water. The western side has many small sandy bays, divided by rocky points.

Near the middle of the island in the immediate vicinity of Agana there is a large spring from which a copious supply of water issues, and this after passing through an extensive swamp, over a lagoon, enters the sea as a river, the channel of which has been artificially lengthened and turned for a mile parallel to the coast, for the convenience of the natives.

Submarine telegraph cables.—There is a cable to Midway Island and Honolulu and thence to San Francisco. A cable connects Guam with Ogasawara and Japan and there is another cable to Yap connecting with Menada (Celebes), and thus with the eastern telegraph system. The telegraph office is open at all times.

Produce.—The soil is dry and fertile. The produce is chiefly maize, rice, coffee, tobacco, taro, peanuts, pineapples, watermelons, bananas, oranges and limes, coconuts, and bread fruit, and there are numerous cattle on the island. The coconut trees on the western side

are in groves 3 or 4 miles in length and 1 or 2 miles in breadth. Fish, fruit, and vegetables are plentiful in some places. Several kinds of domestic fowl are reared, and wild ducks, curlew, gallinules, plover, and doves are shot by the natives for food.

East coast.—The eastern coast of Guam, from Patay Point, the northeast extreme, as far southward as Port Tarofoto, a distance of nearly 20 miles, is rugged and steep, affording no shelter to vessels, and therefore should be avoided during the northeast monsoon. The only openings are Port Pago, 14 miles from Patay Point, accessible only for boats, and Ylic Bay, 2 miles southward of Port Pago, and equally unimportant.

Port Tarofoto, about $\frac{1}{2}$ mile in length by 300 yards in breadth, with depths of from 2 to 8 fathoms over mud, affords shelter at all seasons of the year, and is free from dangers. The hills, which are very steep, rise abruptly from both its sides, and Tarofoto River, the most considerable in Guam, enters the head of the harbor. Port Tarofoto is uninhabited.

The coast southward of Port Tarofoto is low, with sandy beaches and rocky points.

Port Ynarajan, about 4 miles southward of Tarofoto, affords shelter for small craft from westerly winds only, being open to the eastward. Ynarajan village, on the southwest side of the port, has a church and about 300 inhabitants. There is a boat harbor between Ynarajan and Tarofoto.

Agfayan Bay, the next indentation southwest, is much smaller than Ynarajan. It may have good anchorage for vessels of less than 15 feet draft, but it is open to the eastward. At its head is a small brook, where boats can obtain water.

South coast of Guam.—Ajayan Point, the southeast extreme of Guam, forms the eastern side of Port Ajayan, which is so obstructed by reefs that it is dangerous of approach if there is much sea on. The southern end of Guam is an uninterrupted sandy beach fronted by a reef with small islands on it. This reef, after encircling Dana or Cocoa Island, lying between $1\frac{1}{2}$ and $2\frac{1}{2}$ miles from the southwest extreme of Guam, trends northward to the southwest point of Guam, where is the small port of Merizo, only fit for boats.

West coast.—**Umata Bay** (lat. $13^{\circ} 17' N.$, long. $144^{\circ} 38' E.$), nearly 2 miles northward of the southwest point of Guam is sheltered from north, through east, to south, but in the season of westerly winds, or from June to October, it would be imprudent, or perhaps impossible, to remain in it, on account of the heavy swell which sets on the shore.

Machadgan or Tuguene, the southern entrance point, has a reef projecting 200 yards westward of it and a ruined fort, Nuestra Senora de la Soledad, on the hill northeastward. The northern en-

trance point is an isolated rocky elevation, with the ruined Fort San Angelo on its summit. At the head of Umata Bay is a church and the remains of the town, the greater part of which was destroyed by an earthquake on January 25, 1849.

Water.—Good water can be obtained in the stream which enters the bay 400 yards northeastward of Machadgan Point.

Anchorage may be obtained in $7\frac{1}{2}$ fathoms water, over sand shells, with Fort San Angelo ruins bearing 33° and Fort Nuestra Senora de la Soledad ruins 120° .

Coast.—**Facpi Point**, the first projecting point northward of Umata Bay, terminates in an isolated rock joined to the shore by a reef which dries at low water.

Agate Bay, 4 miles northward of Point Facpi, affords good anchorage during northeast winds, but the landing is difficult on account of the reefs which line the beach. The village of Agate has a population of about 700.

Anaya and Alupan Islands lie off the coast, between Point Facpi and Agate Bay.

Orote Point (lat. $13^\circ 26' N.$, long. $144^\circ 36' E.$) is the extremity of a narrow peninsula projecting nearly 4 miles from the general line of coast on the southern side of Port Apra. Orote Islet lies close to the northern side of the point.

Port Apra, on the western side of Guam, has anchorage at all seasons for all classes of vessels, being protected to the northward by Cabras (Apapa), a long, narrow island, with the Luminao Reefs and Calalan Bank extending southwestward nearly to Point Orote.

This port is extensive and safe, but is much encumbered with banks, coral reefs, and islets, the whole of the southeastern part being blocked by them.

Dangers.—A shoal with depths of from $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms over it extends about 200 yards northward of Orote Island and the southern entrance point.

Buoy.—A nun buoy, painted red, is moored in 20 fathoms water just outside the elbow of the shoal extending off the southern entrance point, with Fort Santa Cruz beacon bearing 104° . The beacons and buoys should not be depended on.

A patch with $3\frac{1}{2}$ fathoms water over it and steep-to lies on the southern side of the fairway, with Santiago Fort Point bearing 267° , distant about 800 yards.

Buoy.—The western side of the above shoal is marked by a can buoy, No. 2, painted red.

A rock with $2\frac{1}{2}$ fathoms water over it and surrounded by depths of from 17 to 20 fathoms lies off the southern shore about 1 mile 97° of Santiago Fort.

Spanish Rock, about 1,200 yards north-northeastward of Orote Point, is a shoal, with $2\frac{1}{2}$ fathoms water over it, at the southwest end of Calalan Bank, and is the first danger on the northern side of the entrance. Calalan Bank extends about 450 yards southwestward from Spanish Rock.

Buoys.—A black 50-foot spar buoy is moored, in 35 feet, on the southern end of Spanish Rock. A large can buoy, painted black, is moored in 18 fathoms water about 470 yards west-southwestward of Spanish Rock on the extreme of Calalan Bank.

Shoal.—A shoal with 2 fathoms water over it lies on the northern side of the fairway about 1,600 yards eastward of Spanish Rock.

Buoy.—The western side of the above shoal is marked by a conical buoy painted red and black in horizontal stripes.

A patch with half a fathom water over it lies in the fairway to the northern anchorage, about 1.1 miles eastward of Spanish Rock.

Buoy.—The southern side of the patch is marked by a can buoy, No. 3, painted black.

Shoal.—A shoal with $3\frac{1}{2}$ fathoms water over it is situated on the eastern side of the harbor, and eastward of it is a reef about 400 yards in length, surrounded by shoal water.

Buoys.—The $3\frac{1}{2}$ -fathom shoal is marked on its western side by a can buoy, painted red, and the northwestern side of the shoal water, above mentioned, by a nun buoy painted red.

A can buoy, painted red, is moored in 13 fathoms water on the northwest point of a shoal, awash at low water, which lies nearly 1,200 yards 206° from the western end of Cabras Island.

A patch with a depth of $3\frac{3}{4}$ fathoms over it and deep water on all sides lies 500 yards southward of Luminao Reefs, with the western point of Cabras Island bearing 47° , distant about 1,000 yards.

Buoy.—The above patch is marked on its western side by a can buoy painted red and black in horizontal stripes.

Fort Santa Cruz (lat. $13^\circ 26' N.$, long. $144^\circ 39' E.$).—In the center of the entrance of the southern head of the port is a rock, level with the water, on which stands Fort Santa Cruz.

Leading beacons.—A beacon stands on the northern end of Fort Santa Cruz and another on the shore nearly 1 mile 105° from it. The front beacon is painted in black and white horizontal bands.

Sume village is situated on the northeastern side of Orote Peninsula, westward of Fort Santa Cruz. Piti village is on the northeastern shore of the port southward of the eastern end of Cabras Island and connected to it by a causeway.

Coal.—No modern coaling facilities exist; a small shed holds about 3,000 tons.

Supplies.—Beef, fowls, and eggs can be obtained, but no vegetables. The watering place is at a small river which falls into the

port at $\frac{1}{2}$ mile eastward of Santa Cruz Fort. The casks are usually filled at low tide and the boats sent at high water to bring them off.

Boat channels.—A boat passage about 50 feet wide and deep enough to admit a steam launch at any stage of the tide leads in a south-southwest direction to the wharf at Sume. The entrance to the channel is marked by a beacon consisting of a tripod painted white. It should be left about 40 feet on the port hand entering.

A boat channel about 50 feet wide and dredged to a depth of $3\frac{1}{2}$ feet at low water is entered through the reef southward of the western part of Cabras Island, has a straight direction to the southeast point of that island, and thence straight to the landing place at Piti. It is well marked by beacons, painted red on the starboard and black on the port hand, entering.

Landing is inconvenient, the shore being everywhere fringed with reefs which extend a considerable distance from it, alternating in rocky heads and deep holes. The best landing place, if wishing to proceed to Agana, is at the small pier at Piti about 2 miles from the anchorage; from this there is a good road to Agana.

Telegraph cable beacons.—Two beacons, each consisting of a post 28 feet in height, painted black and white in horizontal bands, and surmounted by a diamond-shaped topmark, painted white, mark the line of the telegraph cables.

The western beacon stands with Fort Santa Cruz bearing 140° , distant about 800 yards, and the eastern beacon with the same fort 191° , distant 620 yards.

The beacons are in line bearing 99° .

Mooring buoys.—There are three mooring buoys, painted white, for the use of United States naval vessels.

No. 1, in 23 fathoms water, lies with the western extreme of Cabras Island bearing 50° , distant about 1,600 yards.

No. 2, in 16 fathoms water, with the same extreme bearing 14° , distant about 1,100 yards.

No. 3, in a depth of 18 fathoms, with the same extreme bearing 33° , distant nearly 800 yards.

Pilots for Port Apra may be obtained by signal off Agana Bay about 6 miles northeastward of Port Apra.

Anchorage may be obtained in 22 fathoms water, over coral sand, with the western extreme of Cabras Island bearing 56° and Fort Santa Cruz 135° , or in a depth of 17 fathoms with the same objects bearing 59° and 143° .

Vessels should always anchor at least $\frac{1}{2}$ mile to the northward of the line of the telegraph beacons.

There is also anchorage for small vessels in depths of from 5 to 15 fathoms over muddy bottom about 400 yards northward of Fort

Santa Cruz, but the approaches to it are narrow and it is surrounded by coral patches from 2 to 3 feet below water.

Directions.—Mount Chachao Alutum, open northward of Orote Point, bearing 101° , has been given as a mark for the entrance to the port, but it is stated that the mount is not easily distinguished by strangers.

The leading beacons in line bearing 105° lead between the black and red buoys marking the shoals at the entrance and about one-third of the width of the channel from the former buoy, while the telegraph cable beacons in line, bearing 99° , lead close to the southern extreme of Catalan Bank, but owing to the background these latter are difficult to distinguish before 10 a. m.

Having passed between the buoys at the entrance, steer about 92° to pass to the southward of the black buoy No. 3, marking the half-fathom patch. When the western end of Cabras Island bears 53° , alter course for it to the anchor.

Tides.—It is high water, full and change, at 7h. 31m.; the rise and fall of the tide is about $2\frac{1}{2}$ feet.

Tidal streams.—Off Orote Point the flood stream sets to the northward and the ebb to the southward.

Coast.—Gapan Islet lies off Presidio (Assan) Point, which is perpendicular and rocky, and situated eastward of Cabras Island. Adelup (Devil) Point, to the eastward, was so named from the strong current which prevails near it at times.

Agana Bay (lat. $13^{\circ} 28' N.$, long. $144^{\circ} 45' E.$) lies between Adelup and Apurguan Points, and its shores are low and sandy. About midway between is the town of Agana, the capital of the island and the seat of government of the Marianas, containing 6,000 inhabitants and about 300 houses mostly on piles. The official buildings, comprising the governor's residence, the arsenal, barracks, and prison, are of stone. A small river crossed by two stone bridges discharges near the town.

Agana Bay can only be resorted to with winds between east-north-east and south, and even then it is bad on account of the permanent heavy swell and the considerable depth of water within a short distance of the reef fringing the shore.

Supplies.—Poultry, eggs, and vegetables are to be obtained.

Coast.—From Agana Bay the northwest coast of Guam is composed of steep rocks.

Tumun Bay, northeastward of Agana, is much encumbered with reefs, but there are several passages through them where boats can reach the shore without difficulty. Gualon village is at the head of the bay.

Point Ritidian is the northern extreme of Guam, the land rising steeply at the back of the point to Machanao Hill, 610 feet above high

water. The bay to the southeastward between Point Ritidian and Patay Point is almost blocked with coral reefs.

Radio station.—The radio station is situated on Machanao Hill, where there is a conspicuous mast.

The call letters of this station are N. P. N., with 300, 600, and 1,800 meters wave lengths.

The channel between Guam and Rota (the next island to the northward) is 30 miles in width, and is, so far as known, clear of dangers.

Outlying shoals (lat. $12^{\circ} 43'$ to $13^{\circ} 06'$ N., long. $144^{\circ} 16'$ to $141^{\circ} 43'$ E.).—The area between the parallels and meridians given, situated to the southwestward of Guam, has been reported to contain many dangerous shoals. A clear channel is believed to exist between this area and the southern end of Guam.

Santa Rosa Reef, of which no detailed description has ever been given, is charted nearly 50 miles south-southwestward of Guam Island, but this position is doubtful.

Galvez Bank, discovered in 1740, is a bank lying about 15 miles from the southwest end of Guam. It is charted as about 11 miles in length in a north-northeast and south-southwest direction, with a depth of 15 fathoms on its northern part.

A dangerous shoal, on which a depth of 12 fathoms is charted, lies about 6 miles southward of the southern extreme of Galvez Bank.

Caution.—Great caution should be observed when in the locality of the area before mentioned, as the positions of these shoals are uncertain and the vicinity should be avoided.

Rota Island (lat. $14^{\circ} 07'$ N., long. $145^{\circ} 13'$ E.) attains a height of about 800 feet above high water and is generally high and steep, except in its southwest part, where there is a low sandy isthmus terminating at the southwest point of the island, in a flat-topped elevation. The dwellings of the inhabitants, who numbered 335 in 1864, are on the isthmus.

The island summit is said to be a volcanic crater, but it has not been active for several centuries and is now covered with an impenetrable growth of bushes and underwood.

Rota is nearly surrounded by reefs. Its northwest coast and the southeast side of the sandy isthmus are bordered with numerous rocks, on which the sea breaks more or less, according to the direction of the wind.

Supplies.—The water in the wells at the settlements on the sandy isthmus is said to be brackish, but there is good water in a rivulet on the east side of the island. Cattle and pigs are reared, and coconuts, breadfruit, bananas, and a few vegetables are grown on Rota.

Landing.—The only landing place is in Sosanlagh Bay, on the northwest side of the isthmus, where there is a small jetty.

Anchorage.—Sosanjaya Bay, eastward of the sandy isthmus, affords shelter from northerly winds, but the coral bottom is very foul. The German naval vessel *Möwe* (1905) anchored in the bay in $9\frac{1}{2}$ fathoms water, over white sand, with Point Taipington bearing 227° and the eastern point of the bay 136° , but this anchorage can not be plotted on the plan. The first steep slope on the eastern side of the plain, bearing 2° , is said to lead into the bay, but the anchorage within the reefs off the western side of the isthmus is a dangerous and confined place, and the guidance of a pilot is advisable if wishing to enter. The bottom is alternate patches of sand and coral.

Aguijan Island, situated 42 miles north-northeastward of Rota, appears steep-to, excepting the rock which lies 1 mile off its southwest point. The north coast has high cliffs with wooded summits. Landing may be effected on the western side, where there are some sandy beaches. There were goats on the island.

The channel between Aguijan and Rota is clear of dangers so far as is known.

Tinian Island, the next northward of Aguijan, from which it is distant about 7 miles, is uninhabited, only a few Government laborers, under a Chamorros, are placed there, chiefly for the exploitation of hunting. Cattle, goats, pigs, and dogs are to be found in a wild state. The meat of the killed animals is pickled, dried, and sold in Saipan. The woods on the island are thick and impenetrable, and the land in places is overgrown with reeds. Population about 200 in 1876. The northwest point of the island is reported to be 3 miles to the westward of its charted position.

Sunharon (Anson) Roads (lat. $14^\circ 59' N.$, long. $145^\circ 36' E.$), on the southwest side of Tinian, is the only anchorage, and is said to be unsafe from June to October, during the southwesterly monsoon season. The bottom is not good, being partly composed of pointed coral rocks.

Supplies.—Cattle, guanacoës, wild hogs, and wild fowl, guavas, coconuts, limes, oranges, and breadfruit are produced on Tinian. Water may be obtained from an ancient well near the anchorage.

Landing can only be effected in a sandy bay, within a reef lying about $\frac{1}{2}$ mile offshore, in Sunharon Roads.

Anchorage.—In 1742 the British naval vessel *Centurion* remained at anchor during September and October in these roads, in a depth of 22 fathoms, over sand and coral, $1\frac{1}{2}$ miles offshore, with Point Lalo, the south extreme of Tinian, bearing 132° and the center of Aguijan about 216° .

Tidal streams.—The tidal streams are strong, the flood setting to the southeastward.

The channel between Tinian and Saipan to the northward is but little known, and should be used with great caution if attempted at all.

Esmeralda Shoal, charted about 17 miles westward of Tinian, was discovered by the master of the schooner *Esmeralda* in 1890, and said to be circular in shape and about 2 miles in diameter, with depths of 25 fathoms at its edge.

In 1904 it was reported that the position given is about 5 miles too far to the northeastward, and that soundings taken from a boat on the bank gave a depth of 12 feet over it, with considerable depths close-to. Caution should be exercised when in its vicinity.

Saipan Island, about 4 miles northeastward of Tinian, may be recognized by its conical peak, an extinct volcano, 1,345 feet above high water, and which has another extinct crater $2\frac{1}{2}$ miles northward of it. The southern part of the island is flat, and coconut trees border the shore.

Some Caroline islanders who arrived between 1840 and 1850 were the first settlers on Saipan. In 1876 the population numbered about 700. The island is mostly cleared and cultivated. Whaling vessels occasionally visit it.

Tanapag Harbor, on the northwest coast of Saipan, is southward of the long reef on which the island of Manjagassa stands, near its center. The channel leading in is narrow and has several scattered rocky heads in it, rendering caution necessary; but when in the harbor it is a snug and safe anchorage for small craft. It has not been closely examined.

Garapan village (lat. $15^{\circ} 12' N.$, long. $145^{\circ} 41' E.$), where a pilot may be obtained, is about 2 miles southward of Tanapag Harbor.

Shoals.—Schildkrote Rock, with 6 feet water over it, lies with the western extreme of Manjagassa Island bearing 16° , distant 2.8 miles. This rock is marked by a bamboo pole from which a lantern light is occasionally shown.

A shoal with about 4 feet water over it is charted about $\frac{1}{2}$ mile northward of the preceding. It is said to be difficult to distinguish, even in a good light, except when it is breaking.

Anchorage.—A vessel may anchor off Garapan during the northeast monsoon, November to May, but not during the westerly monsoon. The anchorage is in 12 to 14 fathoms water, over coral, with the village bearing about 98° , distant $1\frac{1}{4}$ miles. A boat channel leads through the reef to the village, but pulling boats can pass over the shore reef at several places. A good anchorage close to the boat channel is said to be with the western extreme of Manjagassa Island bearing 13° and the highest point of a hill southward of Garapan 98° . With a strong northeast trade there is a very uncomfortable swell at the anchorage.

Magicienne Bay (Laulau-bucht), on the southeast side of Saipan, is where the British naval vessel *Magicienne* anchored in 1858 to cut wood for fuel. The bay is only open to the southeastward, but it can not be recommended as an anchorage, as the depths are about 15 fathoms within 200 yards of the edge of the reef fringing the shore. The best landing place is on the sandy beach eastward of the wooded bluff, in the middle of the bay.

Supplies.—Pigs, poultry, and fruit can be obtained at Garapan; coconuts, breadfruit, and limes are plentiful on Saipan. The cattle then on the island were owned by the Spanish Government. The inhabitants depend entirely on rain for their water supply. Wood is plentiful in Magicienne Bay.

Tides.—It is high water, full and change, at 6h. 45m.; springs rise about 2½ feet.

Medinilla Island (lat. 16° 00' N., long. 146° 00' E.), about 50 feet above high water, is charted about 43 miles north-northeastward of Saipan. It is flat and barren with bold coast, and has vestiges of a crater at its highest part. On the southern and western sides are some deep caverns. The south point has rocks charted off it.

Anatahan Island, northwestward of Medinilla Island, has two high and steep peaks, from 2,300 to 2,600 feet above high water, which are volcanic, and have been seen in clear weather from a distance of quite 40 miles.

The coast is everywhere steep and precipitous, except on the southern side, where there is a sandy beach, and some projecting rocks form a small creek. The island was inhabited when it was discovered by the Spaniards, but there is no known anchorage. Anatahan is covered with trees and bushes, among which is the coconut palms.

Sarigan Island, about 21 miles north-northeastward of Anatahan, is a conical rock 1,804 feet above high water, and probably of volcanic origin. Its rounded summit is well covered with vegetation.

Anchorage.—There is reported to be anchorage for small vessels off its southwest side, where there is a hut and landing place for boats below it.

Beatrice Reef (lat. 16° 32' N., long. 143° 14' E.), about 147 miles to the westward of Sarigan Island and nearly on the same parallel, was seen by the English schooner *Beatrice* in 1888. Discolored water was observed extending eastward and westward about 1½ miles, the depth near the vessel being estimated to be about 4 fathoms.

Zealandia Bank (Piedras de Torres) (lat. 16° 50' N., long. 145° 50' E.), about 10 miles north-northeastward of Sarigan Island, was seen by the ship *Zealandia* in 1858, and appeared to have two patches about ¼ mile apart, with dark water between, the sea breaking heavily on them at times.

The two reefs forming this bank lie in a northeast and southwest direction, and are about 3 feet high in places; they are surrounded by deep water. The southwest reef has two summits about 20 feet apart. In a fairly smooth sea, with a light ground swell, there was a surf on the southwest reef, while the northeast reef was only visible at times.

Guguan Island, lying 37 miles northward of Sarigan, is a small island and much resembles Medinilla Island, before mentioned. Its northern point is the lowest, but presents no facilities for landing, and it is perpendicular and unapproachable on all sides. The island is covered with vegetation. A volcano on this island was reported to be in an active state in 1883. The southern summit is 1,093 feet and the northern 994 feet high.

Alamagan (lat. $17^{\circ} 34' N.$, long. $145^{\circ} 49' E.$), about 17 miles northward of Guguan, has two peaks, the loftiest of which is 2,756 feet above high water. The southeast side of the island is a steep and bare lava slope. On the northeastern side is an extinct crater, the interior of which is visible from seaward, with the island bearing between south and west. The highest point on the north side is a vast crater, from which volumes of smoke sometimes issue. The western side is cut up by deep ravines covered with vegetation.

Pagan Island, about 27 miles northward of Alamagan, has two active volcanoes on it, one on its northern, the other on its southwestern end, the highest peaks being from 1,000 to 1,729 feet above high water. The land is low southward of the northern volcano. Tropical vegetation reaches nearly to the summit of the southwest peaks, but the sides of the northern are nearly bare. Treasure is supposed to have been concealed on Pagan Island.

Anchorage.—The anchorage around the island is bad, being entirely rocky, with little or no shelter. There is temporary anchorage off a cove on the northwest side of the island, where there is a large rock on the beach. Landing is very difficult, as the surf breaks heavily on the steep beach in the finest weather. The southern coast is still more exposed than the northern, but temporary anchorage probably might be found near the high pinnacle rocks lying off the southeast point.

Agrigan Island, about 36 miles 350° of Pagan, has two peaks, the highest 2,461 feet above high water. This island is of volcanic origin and is covered with luxuriant vegetation. It is said to be inhabited.

Supplies.—The *Narvaez* left on the island numerous animals of various kinds, huts and outbuildings, domestic animals, etc., besides pigs, goats, fowls, etc. Coconuts, plantains, and other tropical fruit were abundant.

Anchorage may be found on the southwest side of Agrigan, in front of the only sandy beach on the island, in from 16 to 11 fathoms water, over sandy bottom, the former depth being obtained at about 800 yards from the shore. This anchorage is said to be of considerable size, having room for several vessels lying at single anchor from 450 yards to $\frac{1}{2}$ mile from the beach. A depth of 11 fathoms will be found with the northwest point of Agrigan bearing 336° , and the south point 116° .

Landing is difficult, owing to the steepness of the beach and the heavy surf.

Assongsong (Assumption) Island (lat. $19^{\circ} 42' N.$, long. $145^{\circ} 25' E.$), about 52 miles 350° of Agrigan, is a volcanic cone rising steeply from the sea to a height of 3,117 feet above high water. The crater was active in 1906 and its sides are covered with ashes near the top, with lava cut up by steep ravines lower down. There are a few stunted coconuts and thick underwood below. In clear weather both this island and Agrigan can be seen from a distance of about 45 miles.

Landing.—Some huts stand on the southwest end of the island and eastward of these there is landing for boats.

Anchorage.—The German naval vessel *Condor* (1906) reported anchorage in from 16 to 20 fathoms water on a coral bank off the southern side of the island, the bank being easily distinguished by the light-colored water.

Maug (Uracas) Islands (lat. $20^{\circ} N.$, long. $145^{\circ} 14' E.$), a bare rocky group lying about 20 miles north-northwestward from Assongsong, are three in number, jagged, and form, with their connecting reefs, a circle of about 1 mile in diameter, inclosing a lagoon. The western island is the largest and the eastern is 699 feet above high water. The group presents the appearance of being a conical volcano, the summit of which has fallen in. There are apparently no dangers in the vicinity.

The German naval vessel *Condor* (1906), steering 24° , passed through a channel about 400 yards in breadth between the eastern and western islands with 20 fathoms water, and greater depths in places. There is also a channel about 50 yards wide between the northern and eastern islands in which not less than $4\frac{1}{2}$ fathoms water was obtained.

Reef.—A reef is situated 330° from the northern of the Maug Islands, distant 10 miles.

This reef, reported by the U. S. S. *Supply* in 1910, is about 500 feet long northwest and southeast and about 50 feet wide.

The least depth obtained was 5 fathoms, but shoaler water probably exists, and it has been placed on the charts as a reef with a depth of less than 6 feet.

Landing may be effected on the eastern island near a hut which stands on the shore near the anchorage.

Anchorage.—On the eastern side of the latter passage lie several blocks of black lava, which reach close up to the northern point of the eastern island, and off this part of the coast there is good anchorage in depths of from 12 to 23 fathoms, over lava sand with a coral bottom.

Uracas Island, the northernmost of the Marianas, lies about 38 miles northwestward of Maug Islands. Its summit at the western end of the island forms a regular cone of ashes, about 1,039 feet above high water, and is an active volcano. The north, south, and east sides are perpendicular, with no known offlying dangers. A high rock connected with the island lies on the southeast side, and farther southward are several smaller rocks, one of which is conspicuous. On the southwest side there is also a rock.

The island is barren, except on the southern shore, where there are a few trees and some scant vegetation. It is not known if anchorage can be obtained.

Dangers westward of the Marianas.—**Britomart Reef** (lat. $19^{\circ} 08' N.$, long. $141^{\circ} 35' E.$), westward of Assongsong Island, was reported by the British bark *Britomart* in 1869 to be awash and nearly 200 yards in length. It was unsuccessfully searched for by U. S. S. *Alert* (1881).

In 1910 German naval vessel *Nürnberg* passed within a distance of 5 miles of the charted position of this reef without observing any indication of its existence.

Lindsay Island (lat. $19^{\circ} 20' N.$, long. $141^{\circ} 15' E.$) (existence doubtful) was reported by the schooner *Amelia* in 1848 as a rocky islet 4 miles long and 40 feet above high water. The *Britomart* passed over this position with fine weather and observed no island; and an unsuccessful search was also made for Lindsay Island by the U. S. S. *Alert* in 1881.

Euphrosyne Reef (lat. $21^{\circ} 43' N.$, long. $140^{\circ} 53' E.$) has been several times reported, and the positions assigned to it all agree so nearly as to leave little doubt of its existence. Its position requires to be verified, and it was not seen by U. S. S. *Alert* in 1881.

Parece Vela or Douglass Reef (lat. $20^{\circ} 24' N.$, long. $136^{\circ} 03' E.$) was discovered by the *Iphigenie* in 1789, and examined by the British Naval vessel *Amphion* in 1890, and the position given is that of the largest rock. It is composed of coral with three rocky heads showing above water, and extends about $2\frac{1}{4}$ miles in an east-and-west direction, with a breadth of about 800 yards. The western rocky head is about 10 feet above high water, the middle head about 8 feet, and the eastern head about 2 feet.

There is a boat entrance to the lagoon within the reef, on the southwest side, and apparently one on the northeast side.

The sea appeared to break about 1 mile northward of the west extreme of the reef, but the spot was not examined by the *Amphion*.

Dangers eastward of the Marianas—Reef (lat. $20^{\circ} 30' N.$, long. $153^{\circ} 00' E.$).—A reef has been reported by whalers as situated in the position given, which, however, is very doubtful.

Los Jardines or Marshall Islands (lat. $21^{\circ} 40' N.$, long. $151^{\circ} 35' E.$).—Two small islands in the position given, which is doubtful, were reported by the ship *Scarborough* in 1788, and are thought to be the same as Los Jardines, of Alvaro de Saavedra, 1529. Nothing, however, is known of them beyond the most vague rumors, and their existence is doubtful.

Marcus Island (lat. $24^{\circ} 14' N.$, long. $154^{\circ} 00' E.$), northeastward of Los Jardines, was reported by the ship *Morning Star* (1864) and visited in 1874 by the U. S. S. *Tuscarora* and in 1885 by the French naval vessel *Eclaireur*. It is described as being triangular in shape and about 5 miles in circumference, wooded, 60 feet above high water, and bordered by a white sandy beach with breakers extending off its west, northeast, and east points.

The island is claimed by Japan, its official name being Minamitoro-shima. It is leased to a Japanese who exports albatross, sharks, and tunny by means of a sailing vessel which calls three times during the year.

From October to January is the season for obtaining the birds, and at that time about 50 laborers are brought from Arzobispo or Bonin and Hachijo-ga Islands. The climate is said to be mild, the temperature ranging from 60° to $95^{\circ} F.$

Breakers (lat. $24^{\circ} 04' N.$, long. $152^{\circ} 26' E.$).—The master of the barkentine *Robert Sudden* reports that on February 21, 1897, in the position given, he sailed through breakers for a distance of 4 miles. No soundings were obtained, but the vessel was apparently passing over a reef.

Ganges Islands (lat. $30^{\circ} 47' N.$, long. $154^{\circ} 15' E.$) and a reef about 8 miles to the northward of it are two of the many dangers that have been reported at various times in the locality given for the island, but nothing positive is known as to their proper position, though the numerous reports point to the fact of the probable existence of some danger in this region, the establishment of which is important.

In 1911 the steamer *Winnabago*, and in 1912 the steamer *Seminole*, passed over the assigned position of this island without observing any indication of its existence.

APPENDIX.

VOCABULARY.

A short list of words used at the island of Ebon.¹

English.	Ebon.	English.	Ebon.	English.	Ebon.
Ant.....	Lung.	Give.....	Lethok.	Son.....	Archera.
Arm.....	Pe.	Go.....	Flok.	South.....	Ruk.
Arrow.....		Good.....	Emmon.	Spear.....	Marre.
Bad.....	Fnana.	Great.....	Fllap.	Stone.....	Fjman.
Panana.....	Kal'erong.	Hair.....	Gwal.	Star.....	Uchu.
Black.....	Mata.	Head.....	Pur.	Sea.....	Laugith.
Body.....	Kereman.	Hear.....	Rong.	Sun.....	Al.
Boy.....	Ladrek.	Heat.....	F1 mil.	Sugar cane.	
Pow.....		Heavens.....	Nalong.	Small.....	Errek.
Breadfruit.	Me.	House.....	Im.	Taro.....	
Breathe.....	Menono.	Know.....	Tella.	Teeth.....	Ngl.
Brother.....	le.	Land.....	Fnl.	Thev.....	
Canoe.....	Wa.	Laugh.....	Thing.	Think.....	Lemuge.
Chief.....	Iroth.	Leg.....	Yamma.	Thunder.....	Tres.
Club.....		Light.....	Meram.	Tongue.....	Lor.
Cloud.....	Uchu.	Lightning.....	Iua.	Tree.....	
Coconut.....	Naine.	Live.....	Mur.	Water.....	Dren.
Cold.....	Etcow.	Make.....	Chetchek.	West.....	Kal'elung.
Come.....	Ethok.	Male.....	Man.	Weep.....	Chung.
Darkness.....	Mpune.	Man.....	Man.	White.....	Mute.
Day.....	Rau.	Moon.....	Aleng.	Wind.....	Kuttow.
Daughter.....		Mouth.....		Yam.....	
Die.....	Fndth.	Mountain.....	Tol.	One.....	Iuwun.
Distant.....	Etho.	New.....	Ekal.	Two.....	Drud.
Dog.....	Miga.	Night.....	Rung.	Three.....	Chilu.
Drink.....	Rark.	North.....	Fung.	Four.....	Fmer.
Far.....		Nose.....	Pothlr.	Five.....	Lallem.
East.....	Rear.	Old.....	Emor.	Six.....	Chilchinu.
Fat.....	Mungar.	Place.....	Likete.	Seven.....	Chilchima.
Eye.....	Mech.	Pig.....	T'ing.	Eight.....	Twailhuk.
Father.....	Cham.	Rat.....	Gijerik.	Nine.....	Twalmeluwon.
Fear.....	Imochuk.	Rain.....	Noot.	Ten.....	Iungon.
Female.....	Kurra.	Red.....	Mir.	Twenty.....	
Fire.....	Kejeik.	Sand.....	Pok.	Hundred.....	Ituka.
Fish.....	Iak.	Ship.....	Kundo.	Thousand.....	
Fowl.....	Wagu.	Sit.....	Chetchet.		
Girl.....	Lidrik.	See.....	Loe.		

¹ G. Turner, LL. D., London Missionary Society, 1884.

A few names and numerical terms in the Santa Cruz group and generally understood in the Reef Islands; also those used in Tucopia:

English.	Santa Cruz.	English.	Tucopia.
Arrow.....	Nipna.	Boy (little).....	Jama Tana.
Away.....	Kam.	Brother.....	Jama.
Bow.....	Neter.	Chicken.....	Jokéo.
Canoe.....	Jaoio.	Canoe.....	Jebaka.
Enemy.....	Neleves.	Chief.....	Jeariki.
Father.....	Tete.	Dance.....	Jeneako.
Friendship.....	Kaleane.	Duck.....	Jonos.
Give me that.....	Kam-kaka-bane.	Father.....	Jamana.
Go.....	Va.	Fish.....	Dago.
Hold on.....	Male.	Girl (little).....	Tamadine.
How much; how many.....	Turla.	God.....	Jekave.
His.....	Bade.	Hell.....	Jekavi.
Mosquito.....	Pipa a a.	Heaven.....	Sivaivary.
Mother.....	Ita.	Man.....	Tangata.
Near.....	Vai.	Man (white).....	Pepa Langi.
Night.....	Bu.	Mother.....	Jennima.
No.....	Teke.	Woman.....	Fafine.
Plc.....	Pol.		
Sailing canoe.....	Tepukel.		
Ship.....	Loju.		
To-day.....	Abunaro.		
What is his name.....	Ne te ne.		
Where.....	Na kaule.		
Yes.....	Da apue.		

Numeral.	Santa Cruz.	Numeral.	Tucopia.
1.....	Teja.	1.....	Daci.
2.....	All.	2.....	Tua.
3.....	Atu.	3.....	Jorn.
4.....	Apue.	4.....	Fa.
5.....	Narlunu.	5.....	Lima.
6.....	Ejame.	6.....	Onno.
7.....	Elime.	7.....	Fitti or fitu.
8.....	Etune.	8.....	Mam.
9.....	Epueme.	9.....	Siva.
10.....	Napnu.	10.....	Fuana fanl.
11.....	Napnu eja navade eja.		
12.....	Napnu eja navade li.		
13.....	Napnu eja navade tu.		
14.....	Napnu eja navade pue.		
15.....	Napnu eja navade narlunu.		
16.....	Napnu eja navade ejame.		
17.....	Napnu eja navade elime.		
18.....	Napnu eja navade etune.		
19.....	Napnu eja navade epueme.		
20.....	Napnu eja navade napnull.		

The following list was supplied to the British Admiralty by Mr. F. W. Christian, B. A., Balliol College, Oxford, and corresponding member of Polynesian Society of New Zealand:

English.	Marshall Islands.		Efate (New Hebrides).	Erroman (New Hebrides).
	Eastern group (Ratak).	Western group (Ralick).		
Able; To be.....	Marong.....	Marong.....	Kona; Sele; Sele-bia..	Mafai.
Adze.....	Mal.....	Mal.....	Talal.....	
Arrow.....	Liban.....	Li-ban, Libbon.....	Nālu; Nālu; Tiba; 1 liba; Tuha.	U.
Axe.....	Esur; Djagalil; Ulul.....	Ill.....	Talal; Telet; Karau; Karab; Karam.	Toki.
Bad.....	Nana; Padja.....	Nana; Kot.....	fa.....	Esa; Sa.
Bamboo.....	Koba; Bac.....	Koba; Bac.....	lobu.....	Majira.
Banana.....	Kal-raran; Ka-berang.....	Kaiberung.....	At; Ats; As; Mai'a..	Fuji.
Bay or Harbour.....	I am; Ji in-jojak.....	Ji in-ejak.....	Bahuk.....	Koro-tai.
Black.....	Mej; Kil-mej.....	Mej; Kil-mej.....	Maito; I oaloo; Barea; Horca; Kota.	
Boat.....	Le ban.....	Le ban; I i ban.....	As; Asu.....	
Boy.....	Lo brik; Larrik; Tari-man.....	Ladrek; I ikao.....	Karl; Stri; Suli.....	Tau-sania.
Brother.....	Tei; Tatl.....	Chel; Chatl; Jel; Jati.....		
Breadfruit.....	Mā.....	Mā.....	Beta; Kuru; Bitau; Bitam.....	Kuru.
Breeze.....	Guto-edvik.....	Koto-erik.....	Anglengi; Sau.....	Angi-aki.
Bullock.....	Giru-man.....	Kiru; Kau-man-kon.....	Buli makau.....	Buli-makau.
Calamity.....				
Canoe.....	Wa'a.....	Wa'a; Wā.....	Raru; Raru.....	Boruku.
Channel.....	Ji in-wadok; Tjer.....	Ji in-itok; Tor; To.....		
Chief.....	Irud; Iru; Tamun Uroit.....	Irolj; Irolch.....	Wota; Tui; Ti.....	Erik; Riki.
Chisel.....		Jila-purutu.....	Toki.....	Toki.
Cloud.....	Korra; Karra.....	Koro; Kuro.....	Sok; Tai-ni-langi.....	Poa.
Cook, To.....		Tinim.....		
Club.....	Kangrang.....	Alal-n-rang; Kangrang.....	Mbat; Nabe.....	
Club, To.....		Bok.....	Boka.....	
Cocoa-nut.....	Ni.....	Ni.....	Niu.....	Niu.
Cool.....				
Cold.....	Buo; Mail; Piau; Pao.....	Bio; Mail.....	Milate; Milare; Milaur.....	Mariri.
Copra.....	Wal-ni.....	Wal-ni.....		
Come, To.....	Wa-dok; Wanoj; Waito; Dok.....	Tok; Itok.....	Masu; Mai; Bano-mai.....	Mai.
Cut, To.....	Jip.....	Chip.....	Sila.....	Sere.
Dark.....	Marok; Jong.....	Marok; Merok.....	Tam-tam; Melu-melu; Fanu; Les.....	Marumaru.
Dart, A.....	Gilibilib.....			
Day.....	Tan.....	Tan.....	Ma; Asa; Ali.....	Ao.
Die, To.....	Met; Mej.....	Mij; Mich.....	Mate.....	Mate.

English.	Marshall Islands.		Ehaté (New Hebrides).	Erronan (New Hebrides).
	Eastern group (Rataek).	Western group (Ralik).		
Distant.....	Dô; Tho; Thoo.	Tolok; Toan.	Tonga; Emai; Ufa.	Kuli.
Dog.....	Geru; Kiru-roror.	Kiru-roror.	Kori; Korla; Kuri.	Kal.
Eat, To.....	Munga; Manga.	Monga; Kangi.	Kani; Lam; Fam; Bam.	
Egg.....	I ip.	I ip.		Fafaka-moa.
Evening.....	Thulog-e-al; Du- lok-in-al; Jota.	Jota.	Dariva; Kot-fanu; Rang-fanu.	Afi-afi.
Exchange.....	Mojamuj.	Wia; Wiakrok Wiaik.	Faulu; Baulu; Bioli.	Famata; Tufa.
Eye.....	Medja; Meta; Mida.	Mej; Much.	Mata; Meta; Mita.	Mata; Foi-mata.
Father.....	Djim; Djima.	Jeme; Jema; Cherna.	Ab; Ava; Afa; Tama.	Tamana.
Fear, To.....	Ilubuch.	Mejok; Leingong; Mijak.	Mataku; Mitaku.	Mataku.
Fire.....	Eg; Ik; Kida-ik.	Eg; Kij-ek.	Kabu.	Afi.
Fish.....	Ik; Iek; Iak.	Ik.	Ika.	Ika.
Foreigner.....	Ri-beleo.	Ri-beleo.	Nata-sabo.	Paparangi.
Fowl.....	Bau; Wao; Pao.	Bao.	Toa; To.	Moa.
Fruit.....	Le.	Lee; Len.	'Ua.	Fua.
Girl.....	Lorrik; Lerrek.	Li-drik; Le-drik.	Li-bibia; Bia-fine; Atara.	Tama-fine.
Give, To.....	Lilok; Liwaj; Lidok.	Liwoj; Lelok.	Tua; Sori; Butua.	Tufa.
Go, To.....	Pal; Wal; Lok.	Wan-lok; Dri; Ilok.	Bano-tu; Balo-ta.	Fano.
Good.....	Man; Eno.	Mon.	Ra-rai; Pwia; Mile Mitaki.	Rufic.
Great.....	Lip; Lab.	Lap.	Laba; Leba; Barua; Bea; Bia; Bur.	Sore.
Head.....	Burru; Bur.	Bara; Bora; Boro.	Bau.	Uru.
Hear, To.....	Rung.	Rong.	Trong; Rongo; Dong.	Rongona.
Hew, To.....	Mal; Pal.	Mal; Pal.	Sila.	Sere.
Hill.....	Tol; Dol.	Tol.	Tafa; Benge; Bukutu.	'Oro; Fakarava.
High.....	Utlet.	Utlet.	Ofa; Barab.	
Hot.....	Manan; Bwil.	Manun; Bwil.	Sinu; Makarakara; Sul.	Vela.
House.....	Im; Um.	Iem; Im.	Suma; Uma; Hima.	Fare.
Iron.....	Mâl; Marra.	Mâl.	Mot; Motu.	Motu.
Island.....	Aling; Japnerik.	Aling.	Bau.	Ariki.
Knife.....	Urolt.	Iroi.	Masi.	Sele.
Know, To.....	Dadi.	Jaji; Chachi.	Atai; Ata; Kila; Kita.	Iroa.
Lagoon.....	Dela; Jala.	Jia; Chela.	Namo.	Namo.
Land.....	Lam.	Lam; Jabar.	Fanus.	Fanus.
Land.....	An; In.	Enc.		
Leg.....	Riab.	Riab; Maar; Babu.	Sali; Suru; Bisuru; Sore.	
Lie, To.....	Maram.	Maram.	Mirama.	Marama.
Light.....	Jarum.	Jarum; Jorom.	Bia; Fila.	Tapatapela.
Lighting.....	Mur.	Mour.	Mauri; Malri; Moli; Mole.	Mauri.
Live, To.....			Ba; Fa; Baka.	
Make (causative prefix).	Ka.	Ka; Na.	Mer; Merla; Kaimisi.	Pena.
Make (create).	Marile.	Komanman; Kom.	Mara; Mon; Moan.	Tangata; Tanc.
Man.....	Armid; Man.	Armi; Man; Ro; Leo.	Manu; Laba.	Na-lufai; Lufai.
Many.....	Or; Eor; Lang.	Elang; Jegan; Or; Lok.		
Mast.....	Kodju; Gisu.	Kiju.	Tere.	Jira.
Moon.....	Alung; Aling.	Aung; Aleng.	Ata-langi.	Marama.
Morning.....	Jibung.	Jibung; Iju.	Alati; Bili-asa; Bili- bong; Bilo-bong.	Popo; Popoana.
Mother.....	Djina; Ren.	Jine; China.	Tete; Nina; Raitc.	Jinana.
Mountain.....	Tol.	Tol.	Ofa; Barab.	Oro.
New.....	Kal.	Kal.	Bau; Fau; Fao.	Fau.
Night.....	Bung.	Bong.	Bong; Bongl.	Pô.
No.....	Mol Ap!	Jal Jab!	Eil Is! Sal.	
Ocean.....	Lo-meto.	Meto; Lo-mato.		Tai; Moâna.
Old (of person).....	Lalap.	Ridto; Ritto.	Matu; Kabuer; Riki; Mariki.	Matua.
Old (of things).....	Mor.	Mor.	Tuai; Tucl.	Tuai.
Paddle.....	Kibbet.	Kibij.	Vos; Balusa.	
Pandanus tree.....	Bob; Wob; Wobu.	Bob; Pop.	Kie.	
Parent.....			Wok; Bukas; Bakas; Wango.	Pakasi.
Pig.....	Geru; Pulk.	Pulk; Kirungu- tungut.	Li; Ali; Tokora.	
Place (locality).....	Dikin.	Jikin; Ijo.	Tuaki; Sube; Lsi; Tuku; Butua.	Vere.
Place, To.....	Dikit.	Likit; Rikit.	Uma; Mat.	Ua.
Plantation.....	Bwil; Kallib.	Bwil; Kallip.	Us; Ba; Ura; Usa.	
Rain.....	Ut; Wut.	Wut.		Kimoa.
Rainbow.....	'Iia.	Iia.	Kusu; Kusuwe; Kusuc.	
Rat.....	Kusuk; Gide-rik.	Kich-e-rik; Kij-e- rik.	Miel; Sâl.	
Red.....	Kill-mir; Mir.	Kill-mir; Mir.		

English.	Marshall Islands.		Efate (New Hebrides).	Erroman (New Hebrides).
	Eastern group (Ratak).	Western group (Ralick).		
Reef.....	Wer; Roka; Raka.	Baran; Taga; Ber.	Sikau; Sakau; Kasau.	Fonga-ma.
River.....	Renu-lap; Rendi- drik.	Dren-lap; Dren-rik.	Al-me; Al-sera; Wai- sera.	Vai-tafe.
Rope.....	Tho; Tau; Kokual.	Tō.	An; Tale; Mal.	Taura.
Sail, A.....	Usa-la; Udjila.	Uje-lai; Ujila.	Lai.	Rā.
Sand.....	Bok.	Bok; Erran.	Aran; Oran; On.	One.
Sea.....	Jet; Lo-meto.	Jit; Meto; Lo-jit.	Lau; Tasi; Tas.	Tai.
See, To.....	Lali.	Lolo; Loe; Kil.	Le; Lo; Libi.	Sava; Sira.
Shark.....	Bakka; Paghu.	Bako.	Bako.	Mango.
Ship.....	Waa-n-belu; Wa'a; Beleo.	Wa'a-beleo.	Rarus.	Borika-sore.
Shoot, To.....	Kechbarok.	Ky-barok; Kajik.		
Sin.....				
Sit, To.....	Sithlet.	Jijot; Jubug.	Seka; Toko; Matu.	Puku.
Sleep, To.....	Madur; Medjur; Medur.	Mejur; Gigi; Ki-ki.	Ma-turu; Ma-tur.	Mol.
Sling, A.....	Wuath.	Uaj.		
Small.....	Dik; Ning; Drik; Rik.	Ning; Drik; Rik.	Kiki; 'iki; Kita; Kala; Riki.	Sisi.
Speak, To.....	Konono.	Bā; Konono; Ken- nan.	Taku-taku; Basa.	Bisau.
Spear.....	Gilibilb; Mori; Morre.	Marri; Mari.	'Ola.	Tao.
Steal, To.....	Mejār; Miqōr; Kabudri.	Kōd.	Banako; Bunak.	Jingo.
Stone.....	Rōka; Rāka.	Ejman; Drekā; Raka.	Fatu.	Fatu.
Storm.....		Aire; Ngat.	Kana; Langletu.	'Afā.
Sugar cane.....	Tō.	Tō.	Borai; Porai.	Toro.
Sun.....	Al.	Al.	Al; Ali; Elo; Mita-ni- alo.	Rā.
Taro.....	Kotok; Woth; Ka- dok; Jerat.	Yaraj; Katak; Wot.	Tale.	Taro.
Think, To.....	Lemnok.	Lemnok; Lemnak.	Toto; Roro; Mintoa; Miroa.	Manatu.
Thunder.....	Daru; Tamaluth.	Jorur; Chorur.	Tifai; Buru.	Vajiri; Ngurun- guru.
Tree.....	Wikki.	Wihki; Wikki.	Kasu; Kau.	Rakau.
Truss.....	Mon.	Mol; Mon.	Mau; Mori; Ma-soko.	Mari.
Turtle.....	Wen.	Wun.	Fonu.	Fonu.
Water.....	Renu.	Dren.	Ran; Fal; Vai; Ai.	Vai.
Whale.....	Rāt.	Rāj; Rāch.	Tafura.	Tafora.
White.....	Mo-ūs.	Mouj.	Tau; Tare.	
Wind.....	Gfō; Githu.	Kutau; Koto; Ang.	Langi.	Matangi.
Woman.....	Li; Karra.	Li; Kurra; Kora.	Lā; Ruba; Matu; Li; Koroi; Kuroi.	Fifine.
Wood.....	Kani.	Alai; Kana.	Kasu; Kau.	Rakau.
Work.....	Derbal.	Jerbal.	Meria.	
Yam.....	Matal.	Ogar; Matal.	Katu; U'i.	Ufi; Foi.
Yellow.....	Menamena.	Menamena.	Monamona.	
Yes.....	Inga! Ya!	Inga! Ait!	Iore; Io; Esa; Eso!	
PRONOUNS.				
I.....	I; Nga.	I; Nga.	Ni; Nau; A; Aku.	Vau.
Thou.....	Kwe.	Kwo; Kwe.	Ku; Ngo; Ago; Ko.	Koi.
He; she.....	It.	E.	I; Ane; Nga.	Ela; Ia.
We (inclusive).....	Kit; Kid.	Kit; Kij.	Gita; Kit; Tu.	Kita; Kita - tau; Gita.
We (exclusive).....	De; Kim.	Che; Je; Kim.	Gemi; Gami; Mu; Ami.	Kima-tau.
Ye.....	Kom.	Komi; Kom.	Kumu; Kami; Ka- mus; Agam.	Kimi; Kau-tau.
They.....	Ir; Irra.	Ir; Re; Rerro.	Ra; Ru.	Kiri; Kiratau.
My; Mine.....	Ao; O; —u.	Ao; —io.	—Agu.	Tiaku; Tioku.
Thy; Thine.....	Am (prefix); —om.	Am (prefix); —om; —lom; —m.	—Ama.	Tiau.
His; her's.....	An (prefix); —n.	—cn; an; —n.	—Ana; —Na.	Tiona.
Our (inclusive).....	—ir.	—kijl; —ir.	—Gita; —Ara.	Otea.
Our (exclusive).....	—ar.	—er.	—Ami.	Omea.
Your.....	—emi.	—mi; emi; Ami.	—Amu.	—Aua.
Their.....	—ir.	—ir.	Ancara; Arcara.	Orea.
NUMERALS.				
One.....	Djuon; Duon.	Juon; Chuon.	Iskel; Tesa; Sa; Si.	
Two.....	Rua; Ru.	Ruo.	Rua.	
Three.....	Tilu; Diju.	Jilu; Chilu.	Tolu.	
Four.....	Emen; A.	E; Emen; A.	Bate.	
Five.....	Lailim; Lalim.	Lallem; Lim.	Lima; La.	
Six.....	Dildjino; Dildinu.	Jiljino; Chilchilo.	La-tesa.	

English.	Marshall Islands.		Elaté (New Hebrides).	Ernonan (New Hebrides).
	Eastern group (Ratsak).	Western group (Ralick).		
NUMERALS—contd.				
Seven.....	Dil d j i d j j-m e- djuon; ¹ Dildi- mem-duon.	Jilji-im-juon.....	La-rua.....	
Eight.....	Eidinu; Ejino; Adjino.	Rusitok; Drual- tok.	La-tolu.....	
Nine.....	Adil-me-djuon; Eidi-nem-duon.	Drustim-juon; Ruatim-juon.	La-siti.....	
Ten.....	Chongoul; Dungol; Djungol.	Ngoul; Jongoul...	Re-lima.....	
Twenty.....	Gor.....	Gor.....		
Hundred.....	Lima-gor; Bui.....	Ji-buki; Buki.....	Bunti.....	
Thousand.....	Rabin.....	Rabin; Je-raben..	Bon; Manu.....	
POINTS OF COMPASS.				
North.....	Eang; Eung; Wasog-i-eng.	Eang.....	Tokalau.....	Retu-ma-tonga.
South.....	Irok; Ruk; Wasog-i-rik.	Ruk; Rak.....	Su-e-faté.....	Tauri-tonga-tane.
East.....	Rak; Kasu; Rear.	Rear.....	Alo-saks; Ebau.....	Rue-ta-matal.
West.....	Kep-i-ling; Kepi-i-lang.	Kab-i-lang.....	Etu; Alo-siwo.....	Uri-fa-fa.

¹ Diljji-me-djuon=3+3+1.

Vocabulary of dialects used in the Caroline and Solomon Islands, etc.

[Supplied to the British Admiralty by Mr. F. W. Christian, B. A., Balliol College, Oxford, corresponding member of the Polynesian Society of New Zealand.]

English.	East Caroline Islands.						Nuku-Oro (Monte verde).
	Ponapé or Ponapéi (Seniavina).	Kusale (Strong's Island).	Mokil (Dupey).	Pingelap (McCaills).	Ngatik (Los Valentines).	Mortlock Island.	
Able, to be.....	Kak; Kon.....	Ku; Ka.....	Kak.....	Kak.....	Kak.....	To-ngani.....	Mahai.
Arrow.....	Katiu-en-kachik.....	A-n-put.....	Sila.....	Patsakal; Pungchap.....	Kathu-en-kachik.....	Sia; Sela; Pauppan-gak; Atan-ki.....	Fana.
Axe.....	Chiluet; Rau.....	Koluk.....	Nauna.....	Naona; Kuluk.....	Chinuth; Juith.....	Ingau; Ngau; Tip.....	Toki; Haka-takou.
Rad.....	Pearri; Parrl.....	Alkesem.....	Peri.....	U's.....	Pe-che.....	Us.....	Paupau.
Bamboo.....	Mangat; Karrat; Ut; Tikap.....	Kalas; Us.....	U's.....	Kap-in-tau.....	Uth.....		Matra.
Bay or Harbor.....	Tontol; Tol.....	Molsrom.....	Kap-in-tau.....	Puelepuei; Solsol.....	Kap-in-theu.....	Le-nir.....	Huti.
Black.....	Kachik.....	Sri; Put; Pus.....	Puelepuei; Tontol.....	Kachik; Kalik.....	Thonhoi; Thol.....	Sol; Tol; Trolopuak.....	Taulanga; Ava.
Boat.....	Pusak; Uchol.....	Tolik; Tuilg-mokul.....	Jiri-man.....	Jiri-man.....	Puthak; Cherri-man.....	Mut; Asafir.....	Uluili.
Boy.....						Menkol; At; Ala-moon; Ukau.....	Ata-fana.
Breadfruit.....	Mal.....	Mos.....	Mai.....	Mai.....	Mal.....	Mal.....	Tama-riki.
Bullock.....	Kau-pul-ol-aman.....	Koro-kau-sie-mokul; Tuilik-nati-n-koro-kau.....	Kau-pul-ol-aman.....	Kau-pul-ol-aman.....	Kau-pul-el-aman.....	Apenen-kau.....	Kuru.
Canoe.....	Waar; Ta-n-waar.....	Wak.....	Wa; Wa'a.....	Wa; Wa'a.....	Wa; Waar.....	Wa'a.....	Tama-povi-tane.
Chief.....	Monchap; Ochlopap; Choupetti; Chouma-cha; Au; Mar.....	Kato; Leum.....	Mon-chap.....	Mon-chap; Chou-macha.....	Mon-chap; Chou-macha.....	Samol; Makal.....	Kama; Múne.
Cloud.....	Tapok; Tapuok; Tokol.....	Pak-en-lang; Kasa.....			Thapok.....	Atrou; Wotsom.....	Hoto-arki; Aliki.
Club.....	Chup-en-pok; Lep-en-tuks; Chup-en-fuka.....	Los.....			Lep-en-thuka.....	Iolo; Sop-en-ura.....	Ao.
Coconut.....	Ni.....	Nú.....	Ni.....	Ni.....	Ni.....	Nú; Lú.....	Kauava.
Cold.....	Lamulanur; Peou; Pou; Pau.....	Masis; Eou.....	Pou; Molou.....	Pou; Molou.....	Pau.....	Alou; Fou; Peta-kis.....	Niu.
Come, to.....	Peito; Apeto; Koto; Chamato; Parato; Ukuto.....	Taká.....	In-tó.....	Ala-to; Ato.....	Ko-tho.....	Fal-to; OI-to.....	Makanini.
							Mai; Ilal-mal.
Dark.....	Rotarot; Kun.....	Loslos.....	Rot.....	Rot.....	Rothroth.....	Roto-puak; Kan.....	Kohu.
Day.....	Day.....	Len.....	Ran.....	Ran.....	Ran.....	Ran.....	Rá; Ranga.
Die, to.....	Me; Mela; Mat.....	Mas; Mes.....	Me; Mela.....	Me; Mela.....	Me; Me-la.....	Pou-la; Mes; Me; Mela.....	Mate; Pe.
Distant.....	To'o; Tó.....	Lols; Lolsla.....	Too.....	Too.....	Thó; Tho'o.....	Kukula; Kuku-jang; To-eu.....	Mao; Mamao.
Dog.....	Kiti.....	Koro-ngalingal.....	Tok.....	Kisi.....	Kithi.....	Kolak; Komulan.....	Atu.

East, to	Tungale; Tungel; Namong; Kang; Chak; Mang.	Kang; Monga; Mongo.	Manga.	Manga.	Manga.	Manga; Anglangi...	Kat; Kalme.
Evening	Chau-tik	Onuk; Eukela; Yuhela.	Sau-tik	Sau-tik	Chau-tik	Le-kun-al; Le-kun- yon.	Ahihi.
Exchange, to	Ka-chop-al-i; Ka- uelang; aa-ull.	Aola; Kakobun (buy); Moti (buy).	Natata (buy); Nat- kila (sell).	Natata (buy); Nat- kila (sell).	Ke-ullang; Natl.	Amea-to (buy); Amea-me-la (sell).	Sud; Sula; Kaka- tau.
Eye	Macha.	Macha.	Macha.	Macha.	Macha.	Macha.	Mata.
Father	Chama; Ipa.	Chama; Ipa.	Chama; Ipa.	Chama; Ipa.	Chama.	Sama.	Tama.
Fear, to	Chamak; Medul; Lan- lum; Lom.	Songang; Langang; Senen; Steak.	Chamak; Sama.	Sama.	Chamak.	Nuokus; M a s s k; Yel.	Mataku.
Fire	Ichik; Ai; Yai; Kichl- in-al.	Ichik; Ai; Yai; Kichl- in-al.	O'i.	O'i.	O'i.	Nueme.	Ahl.
Fish	Im-al.	Im-al.	Mam.	Mam.	Mam.	Ik.	Ika.
Foreigner	Oi-en-ual; Men-likl.	Met-palang; Met-sa.	Oi-en-ual.	Oi-en-ual.	Oi-en-ual.	Re-non.	Pe-palang.
Fowl	U'a.	U'a.	U'a.	U'a.	U'a.	Kalek.	Koko.
Fruit	U'a.	U'a.	U'a.	U'a.	U'a.	U'a; Pulik.	Hua.
Girl	Pel-akap; Cherri-pain.	Madan-twis; Tolik- matan.	Jeri-pain.	Seri-pain.	Cherri-pain.	Li-erfan; Fa-pul.	Tama-sefine.
Give, to	Ki; Ki-to; Ki-lang.	Uti; Asi; Sang; Slet; Tuk.	Ki-to; Engklang.	Ki-to; Engklang.	Ki; Ki-lang.	Liamol-n g a n a i; Ngamal; Li-fang.	Kave; Kava-tu.
Go, to	Ko-la; Pel-la; Chama-la	Som; Somla; Fwas; Fwon.	Imla; Ala-ual.	Ala; Ano-ual.	Ko-la; Kaneman.	Fala; Tihel; Ku- kila.	Hano; Kal-atu.
Good	Mau; Kachehel.	Mwombo; Pagl.	Mean; Mucco.	Mao.	Mau.	Allim; Puc.	Tenu; Tenwa.
Great	Laut; Kalk; Pung.	Laplap; Lap; Yok.	Lap; Lalap.	Lap; Lalap.	Laplap; Kalaimun.	Trapur; Lapalap.	Nanu; Nul; Lau- male.
Head	Monge; Coll.	Mong.	Mong.	Mong.	Monge.	Makar; Makr.	pho; Pho-uh; Ulu.
Hear, to	Rong.	Rong.	Rong.	Rong.	Rong.	Rong.	Fuko; Maonga.
Hill	Ula; Tol.	Rong; Longak.	Tol.	Tol.	Tol.	Uan-trukstruka.	Pueri-kar; Pos;
Hot	Karakar.	Fol; Fwol.	Fusen; Fetin.	Fusin.	Karakar.	Fote-kar.	Vers; Madana.
House	Im; Nach.	Lom.	Im.	Im.	Im.	Im.	Hare; Fare.
Iron	Mata.	Mata; Mosra; Mossa; Wesel.	Mata.	Mata.	Mata.	Mata; Mata.	Hao; Paronga; Uasel.
Island	Chap-tik; Tek; Taka.	Fulu; Fwal-e-sik.	Tika.	Tika.	Tika.	Nuku; Luku; Tg;	Wesel.
Know, to	Acha; Kem; Kaan.	Ete; Eta.	Acha.	Echa.	Acha.	Kile.	Ata; Xite.
Lagoon	Nam; Na-lam.	Nem.	Nam.	Nam.	Nam; Lam.	Lam; Nam.	Namo.
Land	Chap; Champs; Pon.	Fwal; Fal.	Chap.	Chap.	Jappa.	Fanu; Fali.	Fama.
Lie, to tell a	O'i; Aramach; Men;	Kikap; K i s p a ; Kusu-in-kas.	Likam.	Likam.	Likam; Li-ap.	Rolama.	Ha-tumina.
Light	Marrin.	Kalem.	Marrin.	Marrin.	Marrin.	Saram.	Marama.
Lightning	Liol; Likamaul.	Saron.	Liol.	Saron.	Liol.	Pi; Fifi.	Ula.
Live, to	Maur.	Mol.	Maur.	Maur.	Maur.	Maur.	Kouni.
Make, to	Ua; Wia; Uiaa.	Ora; Orala.	Ua; Wia.	Konus.	Wiaa.	Moris; Feri; Feris-ta.	Hal.
Man	O'i; Aramach; Men;	Mogul; Mokul; Met.	Aramach; Wol.	Aramach; Wol.	Aramach; Man.	Aramas; A r i m a s ; Moan.	Tangate; Tane.
Many	Neter; Rak; Tookoo.	Peopis; Pupis; Yok.	Tootoo.	Tootoo.	Tootoo.	Nutras; Nutera.	Rakorako; Tau-puno.
Master	Kau.	Kossu; Koeru; Pou.	Pou.	Pou.	Kau.	Au.	Pou; Kau.
Mean	Marran; Chou-ni-pung	Ahus; Malen.	Maram.	Maram.	Maram.	Maram.	Maram.
Morning	Manta; Cho-ran; Mau- chang.	Lenelik; Lutu.	Manchang.	Manchang.	Manchang.	Masate; Le-6or; Uk- 8or.	Tse-6o.

Vocabulary of dialects used in the Caroline and Solomon Islands, etc.—Continued.

English.	East Caroline Islands.					Nuku-Cro (Monte-verde).
	Ponapae or Ponape (Beniamins).	Kusaie (Strong's Island).	Mokil (Duperry).	Pingalap (McCarthy).	Mortlock Island.	
Mother.	Ina; Nono.	Nima; Nne.	Ina.	Ina.	Asak.	Thana.
New.	Kap.	Sasu.	Kap.	Kap.	Sela.	Fou; Hou.
Night.	Pong.	Pong.	Pong.	Pong.	Pung.	P6.
No.	Cho; Chota; Cha.	Mo; Si.	Mo.	Mo; So.	Api; Sa.	Tei; Té.
Old (of persons).	Laut; Li-talap.	Mato; Matoa.	Laut.	Laut.	Li-lap; Rei; Muk.	Matus; Koro-matus.
Old (of things).	Kausia; Marrin; Mar-ring.	Mk; Matu; Mat.	Ten.	Ten.	Mee; Mas.	Mus.
Pandanus tree.	Pole; Talp; Ki-par.	Meng; Mang; Pop; Mai.	Kipar; Pop.	Kipar; Pop.	Fas; Fat; Far.	Fara. Hara.
Pig.	Pulk; Man-tetel.	Pigs; Kosrongtutn-gut.	Pulk.	Pulk.	Pulk; Ptk.	Puaka.
Place.	Uacha; Wacha; Teu.	An; In.	Uaja; Uacha.	Uaja; Uasa.	Le-nie; Ejeug; Echeng.	Va.
Place, to.	Li-kti; Pulkiti.	Likia; Fili; Waki.	Kiti.	Kiti.	Ie-tu.	Tuku.
Plantation.	Mot; Moch.	Ima.	Mot.	Mot.	Mal; Malemal.	Tanunga.
Rain.	Katar; Ut.	Al.	Us.	Kasu; Us.	'Atau; Ut.	Para-o-te-lang; U'a.
Reel.	Kitk; Make.	Koso; Klerk.	Kis-e-tik.	Kis-e-tik.	Yis; Yiz; Laki; Makit.	Kimoa; Isimu.
River.	Mmer; Mar; Ual-tata.	Sas; Sisa.	Ua-sas.	Ua-sas.	Par; Parapar.	U'a; Melo.
Sail.	Takal-mat; Pains; Mat.	Taka; Eoka.	Palna.	Palna; Math.	Os.	A'au.
Sail, to.	Pil-lap; Pil-tik.	Intwal; Fwal.	Pil-lap.	Pil-lap.	Tran-pupu.	Val-tahe.
Sand.	Chal.	Chal.	Chal.	Chal.	Jal; sal.	Taura. Tali.
Sea.	Charrak; Y.	Nes.	Charrak.	Serek; i.	Serek; Serek.	L4.
See, to.	Tangtang; Charrak-Charrak-uai.	Wal; Oai; Wayak.	Charrak.	Serek.	Son; Sal; Serek-la.	Folan.
Ship.	Pik.	Puku; Pok-dust.	Pok.	Pok.	Ti; lik.	One.
Sit, to.	Chet; Nan-choet.	Mnes; Moes.	Set.	Set.	Set.	Tal.
Sleep, to.	Ngar; Kiang; Utal.	Liye.	Sipol-ang.	Kiang.	U'eral; Telal.	Tilo; Kite.
Small.	Pako; Tausal.	Pako.	Pako.	Pako.	Patau; Pako.	Mang6; Taniha.
Speak, to.	Chop; Chap; Wa'a-en-uai.	Wak; Wak-palang.	Wa'a-en-uai.	Wa'a-en-uai.	Wa'a; Jip.	Mune.
	Momot; Monti; Munti; Chuki.	Muta; Matanolon.	Monti.	Monti.	Mat-tu; Mot-tu.	Noho.
	Malr; Ka-mol.	Motul; Metul; Fon-gia.	Malr.	Malr.	Malr; Onit.	Moe.
	Cher; Tikiti; Kichin; Ninining.	Sriklerk; Sikiak.	Chikrich; Sikiak.	Sikiak; Tikitiak.	Kisakia.	Momo.
	Lokaia; Mochkol; Kupur.	Kasras; Fwak.	Lal-lal.	Ma-lach; Makama-lach.	'A-pas; Kapes; Ura.	Pas.

Spear.....	Kath; Kanman.....	Weese; Konts; Ma- tinko.....	Silak.....	Silak.....	Kathin.....	Uok; Wok; Silak.....	Tao.....
Steal, to.....	Lt-chochole; Lt-pirrap.....	Pusels; Pusapas.....	Pirrap.....	Pirrap.....	Limpirhap.....	Sole.....	Kala'sa.....
Stone.....	Takal.....	Eot.....	Sakal.....	Sakal.....	Thakal.....	F'sau; F'au-sol.....	Hatu; Toka.....
Storm.....	Mellmel; Ang-mar.....	Pakea.....	Mellmel.....	Mellmel.....	Mellmel.....	Melamel; Asspual.....	Mako.....
Sugar cane.....	Cheu; Nan-tap.....	To; Tou.....	Tou.....	Sé.....	Chou.....	Uou.....	Tolo.....
Sun.....	Kateph.....	Fuat; Fwat.....	Kase-pein; Sau.....	Kase-pein; Sau.....	Kath-pin.....	Jai; Yal.....	Lá.....
Taro (edible Arum).....	Wot; Wei; M'ang; Chaua.....	Katak.....	Saus.....	Saus.....	Chau; Woth.....	Wos; Uos.....	Tao; Tao - keli; Pur- aka.....
Think, to.....	Lamalam.....	Nangka; Nanok.....	Lemeleme.....	Lemeleme.....	Lamalam.....	Oklet; Kikima.....	Manatu.....
Thunder.....	Nap-chapue; Tupual.....	Pala.....	Sorur.....	Sorur.....	Nan-chapue.....	Tropu-lap.....	Hatur; Hatiri.....
Tree.....	Tuka.....	Sak.....	Tsuka.....	Luka.....	Thuka.....	Ura.....	Rakau; Mon-somo.....
True.....	Lele-pak; Melel.....	Pay; Pai; Oawe.....	Wol.....	Wol.....	Me-le-le; Lele-pek.....	En-let; Let.....	Tonu; Muna-putome.....
Turtle.....	Wei; Kalap; Chapak.....	Ngé; Iku; Ikmuet.....	Wol.....	Wol.....	Wol.....	Won; Wol; Puer- puer.....	Holu.....
Water.....	Pil.....	Kof.....	Pil.....	Pil.....	Pil.....	Tran.....	Val.....
Whale.....	Roch; Rak.....	Leat; Lát.....	Ras.....	Ras.....	Rach.....	Ra'u.....	Tahora.....
White.....	Pueteput; Potopot; Puotapuot.....	Foslos.....	Puotapuot.....	Puotapuot.....	Puethapueth.....	Potrapote; Potso- pots.....	Hina.....
Wind.....	Ang.....	Eng.....	Ang.....	Ang.....	Ang.....	Asspual; Feng.....	Matang; Angi.....
Woman.....	Lí; Pein.....	Matan; Mutan.....	Lí; Yen.....	Lí; Yen.....	Lí.....	Trapot; Rapot; Lí; Fun.....	Fifine; Ahine.....
Wood.....	Kiehin-tuka.....	Ip-an-sak.....	Suka.....	Suka.....	Thuka.....	Amuts; Kis-in-urs.....	Rahle.....
Yam.....	Kap; Kep.....	Mato.....	Kap.....	Kap.....	Kap.....	'Ep.....	Uhl.....
Yes.....	Ei; lei; Nga.....	Ao; Aok.....	Ei.....	Isi.....	lei; Nga.....	Ewar; Euar.....	Io; Ua.....

Vocabulary of dialects used in the Caroline and Solomon Islands, etc.—Continued.

English.	Central Caroline Islands.				West Caroline Islands.	
	Pulawat (Enderby Island or Los Martires).	Lamotrek.	Satawal (Tuckers Island).	U'leal.	U'tuthl.	Yap (Wap).
Truk; Ruk (Hogulu or 'C. kulu).						
Tufite; tufiteh.	Blok.	Alok.	Blok.	Tai; Alok.	Walok.	Blo; Ablo.
As-e-fie; As-e-feh.	Sopal; Tapol.	Porkol; Suspal; Sepal.	Tanak.	Isorpol; Moll.	Putugul; Githam.	Betungul; Tau; Tala-
Kaut; Seie; Kouk; Sila; Sila-akan.	Ingau.	Ingau.	Ta-mag.	Ngau.	Tal-kof.	ber; Col; Tora; Tala-
Ingau.			Polhi; Pahl.	Puam; Pu; Wowau; Wouwou.		Kerb; Ma-kereb; Gles; Mor; Pun.
	Us.	Us.	U'sh; U's.	Ut.	Uth.	Pau; Pat.
Ute; Ueb; Rubu.						
Le-nien-fetok; Maut-an-waa.	Sol.	Trol.	Rotal.	Rl.	Rol.	Roro.
Black.	Uon-ago.	Chart; Yari.	Etane; Tanek.	A-punga punga.	Pittier; Puchu.	Abetir Betur; Bochl-
Boy.	Mais.	Mai.	Tadmam.	Sari-mato; Yari-mal; Sear-mal; Tere-mal.	Mal.	Thau; Yao.
Breadfruit.	W'a.	W'a.	Am; U; Sakman.	Ma; Moel.	Wa'a.	Muy; Ma.
Bullock.	Samol.	Tomol.	Somol; Tomol.	Kau-kifi-it-mal.	Tamol; Thamol.	Madang a dang; Pilung.
Cane.				Paloko.		Tharaml.
Chief.				Thap.	Se-buthag-al-lang.	lang; Tungo.
Cloud.		Mal-el-lang				
Club.	Wak; Usk; Wok; Wauk.		Ruan; Ro; Nu.	Ld.		Nlu.
Cocanut.	Nu.	Veol.	Ilo; Ilo; Pui; Per.	Vaur; Saleu.	Vol.	Olum; Ga-rubeb.
Cold.	Fai-to; Et-to.	Rot; Rotal.	Ilo; Ilo; Pui; Per.	Maiga; Kare-to.	Putho.	Mo; Mut; Ab; Eb; Ub.
Come, to.	Roto-pua; K'un; Roto-pua.		Rot.	Rot.	Roth.	Lumot.
Dark.	Roto-pua.					
Day.	Ran.	S'al.	Ran; Ral.	Yalo; Ral.	S'al.	Ran.
Die, to.	Me; Pe.	Mat; Me.	Mis.	Ma; Fula; Mis; Mi.	Ma; Fula; Mis; Mi.	Me; Yam.
Distant.	Tau.	Tau.	Tau.	Seo; Seo-lox.	Thau.	Taurul; Wutaurel.
Dog.						Olom; Botoel.
Eat, to.	Kalag.	Galago.	Galago.	Kulako.	Pes.	Kal; Moko; Thamun-
	Monga; Ani.	Mongo.	Mounga; Munga.	Nuli; Manga.		mun.
Evening.	Le-kuni-al; Le-faf; Le-pung; Kame.	Le-faf.	Le-faf.	Upung; Le-faf.	Se-pellel; So-talet.	Kalau; Fanel.
Exchange, to.	Wak; Usk; Wok; Wauk.	Le-neli; Kame; Gamseu.	'Ame.	Eamli; Kame.	Sua-hua-pallel; 'Ame.	Wara-lanami; Chnal; Chuago.

[illegible]

Tree.....	Ira; Trunakit.	Ira.	Ira.	Ira.	Ira.	Kakel.
True.....	Let; Wenawan.	Inst; Net.	Inst; Net.	Inst; Net.	Tes.	Rini.
Turtle.....	Puerpuer; Puespuas.	Wong.	Wong.	Wong.	Woi; Hotep.	Woi; Wel; Darao;
Water.....	Konuk; K a n u k ; Korruk.	Tral.	Ral; Ralu.	Salu.	Tral.	Dagao. Ran.
Whale.....	Rat.	Ras.	Purpos.	Ware; Wet.	Ras.	Rat.
White.....	Putepute; Putocheputch.	Yang.	Yang; Yang.	Yang; Ang.	Yang.	Uedenech; Wetsawets
Wind.....	Asapual.	Robut.	Rabut; Fafin; Fafid.	Trauwt; Trauwuta.	Fenil.	Fun; Fung; Feng.
Woman.....	Li; Ni; Fme; Fedin; Feifin.					Pepen; Pin.
Wood.....	Amut; Amuch.			Kau.		Kakel.
Yam.....	Ep.	Dako.	Oi; O; Ya; Chin.	Puhik.		Door; Dol; Pap; Thap
Yes.....	U; U-me; Ewer.	Nga.		Ila; Eoro.	E.	Yer; Nga; Hu.

Vocabulary of dialects used in the Caroline and Solomon Islands, etc.—Continued.

English.	West Caroline Islands.		Marianas.	Palao.	Solomon Islands.		
	Sorol and Tobl.	St. Davids.			Yasbel (Bugotu.)	Malta or Malaita Island (Sua).	Guaialcanal (Vatua-ranga).
Able, to be.	Walsi.		Siniya.	Longimoi.	Tango-malaga.	Omo.	Tango-mona.
Arrow.	Turoi; Aniel; Topo.	Hapatok.	Gechai.	Tejebiri; Ton; Kim; Koutli.	Hirama; Mahao.		
Bad.	Ingau; Tagam.		Chahat; Abale; Bale.	Makngel; Makngit.	Nalka.	Elaba; Dala.	Taulaka.
Bamboo.	Sil.		Bau.		Gau.	'Aio.	Hau.
Bay or Harbour.			Aga; Chorda.		Vundl.	Huti; Hudi.	Vudi.
Black.	Wal-sar's.		Atolong; Tolong.		Tongo.	Roto-hono; Pulu-pula.	Bora.
Boy.	Werewech-a-mare; Farlar.		Pagon.	Ngalet.	Bago.	Pasi.	Periga.
Breadfruit.	Mal; Sugai.	Mal.	Lemai; Dug dug.	Pla-mal; Medu.	Dathe; Nygarl.	Kak.	Baka-mane.
Bullock.			Toro.	Kau-sakai.			
Canoe.	Wa's; Wa.	Wal.	Sangman; Sahad.	Kabekel.	Bulumakau.	Pale'o.	Bulumakau.
Chief.	Werier.		Makana; Huiton; Megat; Uritol.	Rupak; Arkia i; Futi; Abatu.	Vaka.	Bulumakau.	Vaka.
Cloud.	Mek-c-reng.	Tharaml.	Paghes; Ma-paghs.	Make-n-talangeli.	Parako; Puni.	Alaba.	Taovia.
Club.			Galande.	Ithung.	Tila.		Tila.
Cocconut.	Riu.		Nidjok.	Leus.	Nlu.	Uru; Salo.	Nlu.
Cold.	Ma-tarasum; Featu.		Ma-nenging.	Kulle; Kuli; Ma-ke-rasum.	Gaula.	Mamandi; Wawal.	Bisi.
Come, to.	Batu; Bittu; Mori; Mori-bello.		Mal; Momalla.	Mal; Mal; Una-mal; Maruko; Ma.	Taveti-mal; Mal; Rugu.	Lae-mal.	Mal.
Dark.	Sar's; Ros.		Hombom; hum-hum.	Kasus; Rumakum; Mikula; Muga.	Puni.	Roto-hono; Roto-hono.	Robo.
Day.	Yoro.	Ran.	Habe.	Keos.	Aho; Ndanl.	Sato; Sun.	Aso.
Die, to.	Mat; Puruk; Meth.		Matat.	Mathel; Math.	Thene.	M'ae.	Mate.
Distant.	Yatau; Tao; Tau.		Chago.	Korothl.	Tau; Dhau.	'Au.	Sau.
Dog.	Pis.	Ngif; Gif.	Galago.	Pilis; Pils.	Iu.	Ugu.	Pal.
East, to.	Moks; Mangdo.		Chumochio; Chomochio; Kano.	Mungs; Mungur.	Gania Vanga.	Ngua; Ngdu.	Mosa; Monza.
Egg, an.	Sakat-llyala.		Pupuengi.				
Evening.	Tar-geomak.	Lé-magaf.	Fahan.	Uitaku; Ultrou.	Faisolhe.	Uzi.	Vongl.
Exchange, to.	Ke-thuer; Tangak.		Mat.	Math.	Mat.	Mā.	Mata.
Eye.	Tama; Mela.	Tama.	Tata.	Thama.	Tama.	Tama.	Tama.
Father.	Tama; Tima.		Ma-a-liau; Ma-anryo.	Matagi; Bobolo.	Matagi; Bobolo.	M'au.	Matanu.
Fear, to.	Matak.						

Fish	Yaf, Yaf	Yav	Guah	Toto	Dungi, Tunga	Laka
Fish	Yaf, Yaf	Ik	Guhan	Negri	Pai, Ira	Cheche
Foreigner			Kalutut	Kali-ar-sangbarath	Bimbali	Tsingho
Fort	Mar, Aliyang	Maluk	Kalutut	Malik	Kokorako	Kokoroko
Fort			Tingoda	Aratik	Nagat	Kuvak
Girl	Wawech, a-vaivi		Pagon-na-pala	Kokor-dil	Nagat-raivine	Baka-lakave
	Pakalaviv		Pagon-na-pala		Nagat-raivine	
Give, to	Kasi, Wasi, Li, Kanei		Nabe, Nae	Bis, Mis; Pes; Me-sang, Pesang	He, Lululu	Tusa
Go, to	Bitu, Pauo		Hansao	Mara, Inia, Morlis	Tavete, Hatu	Vano
Good	Mapia, Ysaung; Magou; Magol	Mautil; Mautil; Mautil		Marok	Toke	Vasea
Great	Klu; Yamp; Kaglei	Dangkulo; Magas		Klou	Hutu	Loki
Head	Fathuk; Sinn	Ulo		Path-el-ulu	Ulu	Loya
Hear, to	Longalong; Ronggo-glong	Hungag; Hunguk		Rangus; Rangus; Rangus; Rangus	Rango; Rorango	Rangomi
Hill	Wubuts; Vuas	Me-ipe; Kalih		Kield; Keaid; Kaid	Polo; Susaupe	Vatu-ranga
Hot	Nim; Yim	Guma; Gima		Elei; Balal	Guguvu	Papara
House	Sifer; Wathai; Pisu	Lulog; Lulik; Lulug; Luluk		Thei	Vatha	Vale
Iron	Pangul	Tano		Vulo	Meumolu	
Island	Far-e-lik			Githathas; Ando	Manatani; Sai	Ndondoni
Know, to	Gora	Tano		Bulo; Gut	Undulu	Vera
Lagoon	Ram	Dagi; Man-lagui		Ka-nul; Baga-nul	Hanus; Hanue	
Land	Massei	Malag; Ina, Lam-lam		Lamas; Lemes; Lo-mas	Muamunya	
Lie, to tell a	Siyar	Lamaia		Thurum; Thurum	Vitili	
Light		Lalala		Muru; Telele	Havi	Mawri
Lightning	Marup	Maruel		Marul	Mauri	
Live, to	Sier-lath	Tau-tau		Ar-sakal; Lakath; Ar-sakath	Thinci; Mane	Thone; Mane
Make, to	Flak; Flig; Moruel	Magat; Megal		Motuk; Patok; Pe-tuk	Thone	
Man	Erimat; Mor; Mar	Falina		Kal-bati; Orak	Setho; Suka	Sumbo
Many	Pipli	Agasan		Buyul; Puel	Sokara	
Mast	Maram; Muku	Nana		Gnulta-kas	Warowaro	Vula
Moon	Ni-mar-er	Laga-mallel		Adalath; Kadli; Adalath	Vuvugol	Ndani
Morning	Thin; Miser	Pagu		Pages; Pakes	Indo	Tina
Mother		Ahi; Munga		Di; Deak; Dert; Dimsak; Thiak	Nike	
New	Fou	Loou		Wothat; Wuthig	Roto; Rodo	Vaolu
Bo; Bong	To; Te; Tai, Nauari	Muku		Mogot; Mugot; Arak-wothal	Kas; Haika	Bongi
No	Mauri; Rae-ras	Bihoo		Baga-lai; Suk		Tau; Tahara
Old (of persons)	Moribeth	Ag-eg; Palagal; Palong; Kalo				
Old (of things)	Fas					
Pandanus tree						

Vocabulary of dialects used in the Caroline and Solomon Islands, etc.—Continued.

English.	West Caroline Islands.		Marianas.	Palao.	Solomon Islands.	
	Sorol and Tobl.	St. Davids.			Yasbal (Bugotu.)	Mala or Malaita Island (Sea).
Pig.	Pelk; siro.		Babul.	Babi.	Bothe.	Pwo.
Place.	Teti.		Polo.	Ma-keirel.	Bale; Vido.	B6.
Plantation.					Sobo; Talu.	Va.
Rain.	Yut; Ut.		Uchan.	Kul; Gul.	Angutu; Mathathe.	Mola.
Bat.	Yis; res; Tomlu; Ket-slets.		Chaka.	Dearb; Barb; Bor-robo.	Nema; Nemo.	Uss.
Red.	Uagl-sass; Ye-ngangu.		A-gaga.	Alukas; Lukas.	Mela; Sisi.	Gasure.
Reef.	Rau.		Sading; Sadding.	Karango; Kalad.	Noxo-roa; Noro.	Chichi.
River.	Rope.		Tali; Tale.	Kil; Keg; Kalg; Garel.	Wai-paine.	Ko-loki.
Sail, a.	Tar; Tari.		Laldia; Layag; Lad-jag.	Yars; Yarets.	Walo.	Ropu.
Sail to.	Yul; Yi.				Pwana.	Salo.
Sea.	Pl.		Ma-layag.	Mo-yarets.	Matha.	One.
See to.	Tat.		Unal.	Thaab; Thaob; Thuab.	Horara.	Tasi.
Ship.	Misgi; Gabanigi.		Tasi; Chat.	Mes; Maklagna.	Rel-rel; Regl.	Rel.
Ship.	Pako; P6.		Livi; Li.	Kading; Gatheng.	Ele.	Paswa.
Sit to.	Wa-wai; Parso.		Sangman; Sahadu.	Dabi; Deal; Theal.	Faka-buta.	Faka-loki.
Sleep, to.	Matlu.		Matachu; Matachu.	Dunkuk; Dinkuk.	Sopou.	Toutu.
Small.	Mathagi; Mose; Moma-tidi.		Malgu.	Mokovivi; Kullovivi.	Nere.	
Speak, to.	Pe-tsukitsik; Botsu; Takoutet.		Dikiki.	Maknal; Kakra.	Iso.	Tetelo.
Speak, to.	Titri; Titir; Titinup.		Sangan; Atingan; Nangan; Alag.	Lokoli; Mo-lokoi; Dekisi.	Wala; Ere.	Zare; Hoko.
Speak.	Gathe; Kavei.	Dilok.	Gugdanum; Togcha; Fodfod.	Rumu; Lillid; Kul.	Hagore.	Bao.
Steal, to.	Piglaf.		Chule; Chull.	Borobo; Mirakaro.	Garatu.	
Stone.	Fath; Vas.	Thar.	Achu.	Path.	Bilau.	
Storm.	Baglath-alangi.		Pagdu; Pagyo.	Rabarabak.	Gahira; Vatu; Batu.	Vatu.
Sugar-cane.	Sun.		Tupo.	Olu.	Tavuge-magavu.	
Taro.	Var; Yaro.	Eat.	Ardao; Adao.	Kace; Sils.	'Olu.	
Think, to.	Woi; Burak.	Burok.	Suna; Biga; Popau; Baba.	Kuko; Kukao.	Aho.	Aso.
Thunder.	Len.		Haso; Atti-tule.	Malak; Lutkila; Aranak.	Gagama; Toga.	Papanda.
	Pal; P4.	Parre.	Hulu.	Parapas; Daslu.	Gumu; Kukuro.	

Tree.....	Sirket.....	Hayu; Hadju.....	Karegar.....	Gal.....	Dango; Drango.....	Hal. Utuni.
Turtle.....	Tath.....	Me-gahit; Tumas.....	Morre; Marra.....	Tutuni.....	Wal.....	Ko.
Water.....	War; Warl.....	Hagan.....	Galyap; Wal; Ngasak.....	Vonyo.....	Reares; Rerea.....	Sore.
Whale.....	Taru; Sar.....	Hannu.....	Ralum.....	Rea.....	Drang; Oru.....	Kakave.
White.....	Rath; Kas.....	Dambuhala.....	Ral; Mathob.....	Vuavilla.....	Hue; Kanl.....	Hal.
Wind.....	Butsibuts.....	Apaka; Paka.....	Ayolt; Alolt.....	Pura.....	Dango; Drango.....	
Woman.....	Yang; Angi; Goto.....	Manglo; Mangu.....	Ar-thil; Ara-dil.....	Guri.....	Uhl.....	
Wood (firewood).....	Falfin; Valvi.....	Palawan.....	Karegar.....	Gal.....		
Yam.....	Tomotsi.....	Hayu.....	Thap; Tel-ngot; Tan- ngot.....	Uvl.....		
Yes.....	Korei; Dar; Kuri.....	Dago; Niki; Nika.....	Athong; Atha; Ole.....	Hil.....	Iau.....	Es.
	Ila; Ira; I.....	Hu; Hongan				

PRONOUNS.

English.	Central Caroline Islands.					West Caroline Islands.	
	Truk: Ruk (Hogulu or 'Okau).	Pulawat (Enderby Island).	Lamotrek.	Satawal (Tuckers Island).	Utael.	Uluthi.	Yap (Wap).
I.	Ngang: I; U.	Ngang: Ko; Kel.	Ngang: Gang.	Ngang: Ku; Gel.	Kang: Rang.	Ngang: Kel.	Iagag. Ieug. Gur.
Thou.	En; Ko.	A; I.	Kit.	A; I.	Ke: Rel.	I.	Be; Ke: I.
He; She.	Sa; Kite; Kich.	Kit.	Kit.	Kit.	Kis; Ru.	Kith; Kit.	Da; Dad; Ngodad.
We (inclusive).	Am; Sa.	Am.	Am.	Am.	Ami; Mu.	Am.	Ma; Mad; Ngomad.
We (exclusive).	Am; Au.	Am.	Am.	Am.	'Ami; Eml.	Hami; Kami.	G u m a d; Ngomel; Gunen (dual).
Ye.							Ra; Ra-ed; Ngo-rad.
They.	Ir; Ra.	Ir.	Ir.	Il.	Il; Ial.	Trotalal; Trotalar.	Rog; Rok; -ag; -ak.
My; Mine.	Nai; Nel.	-el.	Ual; Ial; -al.	-el.	Ial; Est; -el.	Ir.	Rom; -am.
Thy; Thine.	Nom; Om.	-am.	Iam; -am.	-am.	Iam; -um; -em.	-om.	Rok; Ron; An.
His; Hers.	Noun; Naun; An.	-el; -el.	Ial; -al.	-el; -el.	Tal; -el; -al.	-el.	Rodad; -dad.
Ours (inclusive).	Na-uch.	-et.	Iat; -at.	-at.	Iat; uru.	-eth.	Romad; Mad.
Ours (exclusive).	Na-am; Am.	-amam.	Iamam; -amam.	-amam.	Iamam; -mu.	-am.	Ro-med.
Your.	Na-umi.	-am.	-am.	-am.	Fam; Iam; -am.	-am.	Ro-rad; -rad.
Their.	Na-ur.	-ar.	-ar.	-ar.	Ial; Ial.	-ar.	

NUMERALS AND COMPASS POINTS.				
One.	Eu.	Sa; Eu.	Yat; Si.	Yot.
Two.	Ru.	Uto.	Ruo; Ru.	Ru.
Three.	Uuat; Etl.	Vu.	Eu; Au.	Yali; Toi.
Four.	Ruau; Fan.	Vu.	Fa.	Fang; Fa.
Five.	Umu; Lim.	Lim.	Limau.	Lim; Limou.
Six.	Uonou.	Uonou; Onou.	Lim; O).	Vol; Wal; Onu.
Seven.	Fua; Fusa.	Fua.	Fia.	Fia; Fua.
Eight.	Wau.	Wal.	Wal; Wan.	Wal; Wan.
Nine.	Tuu.	Tu.	Tu.	Ilvo; Ilzu.
Ten.	Engoi; Ik.	Engoi.	Si-ngoul.	Sek; Ek.
Hundred.	I-puku.	Puku.	Puku.	Sem; au; B u k u; Se-buku.
Thousand.	Engaru.	Engaru.	Angaru.	Angar; Angoras.
				Bukith; Se-bukith.
				Wubiu; Buiyu; Buyu.

Vocabulary of dialects used in the Caroline and Solomon Islands, etc.—Continued.

POINTS OF COMPASS.

English.	Central Caroline Islands.				West Caroline Islands.	
	Truk; Buik (Hoguin or 'Orain).	Pulawat (Enderby Island).	Lamotrep.	Sataval (Tuckers Island).	Uileal.	Uluthl.
North.....	Efing; Alang.....	Ewang.....	Evang.....	Euang.....	Efang; Ma-efang.....	Yivang.....
South.....	Er.....	Eur.....	Eaur.....	Eur.....	Eaur; Ma-yur; Ma-oru.....	Yur.....
East.....	Mak-rang; Mase-il-lang.	Koteu.....	Kotul.....	Koteu.....	Koto; Kothl; Koto; Mataral.....	Matharal.....
West.....	Apl-nang; 'Apellong. Loto.....	Loto.....	Lotu.....	Loted.....	Loto; Loto; Ma-leu.....	Lethao; Ma-lethao.....
						Laloch; Laloch; Lee-lot.
						Imuch; Imut; Emuch.
						Ngak; Ngak.
						Ngai; Ngol.

PRONOUNS.

English.	West Caroline Islands.		Marianas Islands.	Palao Islands.	Solomon Islands.	
	Sorol and Tobl.	St. Davids.			Yasbel (Bugotu).	Malal or Malaita Island (Sae).
I.....	Nang.....		Guabo.....	Ngak; Ngag.....	Inau; Nau.....	Inau; Nau.
Thou.....	Go; Gu; Ger.....		Hago; Go.....	Ko; Kau.....	Goe; Ko.....	Hoe.
He; She.....	I.....		Gula.....	Iget; Ngel.....	Ia.....	Ala.
We (inclusive).....	Kla.....		Hita.....	Ki; Kith; Dedel; Dedal.....	Gita.....	Hita.
We (exclusive).....	Gami.....		Hami.....	Kaman; K'imam.....	Gami.....	Hami.
Ye.....	Ham.....		Hanyo; Hamdjo.....	Gemi; Komeu; Kameu.....	Gamu.....	Hamu.
They.....	Er; Erro-mata-karar.....		Siba.....	Ndir.....	Ira.....	Hira.
My; Mine.....	Yal.....		-abu; -ko; -ho.....	Ragnak; Ak; Lik; Lik.....	-gu.....	Ngu; -gu.
Thy; Thine.....	Yam.....		-mo.....	Lm; Leam; Im; -m.....	-mu.....	Nimu; -mu.
His; Hers.....	Yar.....		-nla.....	Ragnal; Lei; Lili; K'el.....	-na.....	Nina; -na.
Our (inclusive).....	Yas.....		-ata; -to.....	-ith; -ath; -eth.....	-da.....	Dids; -da.
Ours (exclusive).....	Yaman.....		-mami; -ama.....	Lam; am.....	-mami.....	Nimami; -mami.
Your.....	Yani.....		-niyo; -hami.....	Lami; ami.....	-mlu.....	Nimlu; -mlu.
Their.....	Yir.....		-tha; -etha.....	Lallr; ndr.....	-dia.....	-re; -da.

NUMERALS AND COMPASS POINTS.

One.....	Yat.....	Me-las; Hasi; Hae- ing-yai.....	Tong; Tang; Athang Ru.....	Sa; Si; Sitel.....	T.....	Kea. Ruka. Tolu.
Two.....	Glu.....	Hugus; Hugu-jai.....	Dei; Thel.....	Rua.....	Rue.....	
Three.....	Yá; Suru; Sri.....	Tato; Todu; Todju- jai.....	Wang; Ang; A.....	Vati.....	H'ai.....	Vati.
Four.....	Oau; Vá.....	Fat-fat; Fai; Fad- fat-jai.....	'Im.....	Lima.....	Lime.....	Jehe.
Five.....	Nim; Lim; Limcou.	Lalime; Limi; Limi- jai.....	Malong.....	Ono.....	Cno.....	Ono.
Six.....	Wér; Wou; Wou.	Guagunum; Gomm- jai.....	Weth; With.....	Vitu.....	H'u.....	Vitu.
Seven.....	Vis; Viju; Vithou.....	Fafte; Fafut-jai.....	Tei; Ei.....	Alu.....	Walu.....	Alu.
Eight.....	War; Waru; Waru	Guagulu; Guadju- jai.....	Tu; Tew.....	Hia.....	Siwa.....	Si.
Nine.....	Tú; Tiu.....	Saigua; Siwa.....	Makuth; Makoth.....	Se-lee; Hanga-vulu	Tangabulu	Sangavulu; Patu.
Ten.....	Sák.....	Me-onot; Mant-tai.....	Thirt.....	Hathangatin.....	Tangereu	Sangatu.
Hundred.....	Bong.....	Gatus.....		Toga; Tonga.....	Mola.....	Toba.
Thousand.....		Chilan; Chalan.....				

POINTS OF COMPASS.

North.....	Yavaang.....	Evong.....	Timi; San-lego.....	Delokus; Thilugus.....
South.....	Eurgl.....	Ior.....	Seplun; San-hadje.....	Dimis; Dimus.....
East.....	Gatu.....	Rak.....	Manuu; San-katan.....	Gongos; Kongos; Ongos.
West.....	Roto.....	Lito.....	Fanu-ipan.....	Barath; Barth; Anga-barath.

Vocabulary of dialects used in Mala or Malaita Island, Solomon Group.

"To'a Ba'ita" dialect, commonly known as "Malu'u," is spoken by a race of people in the north of Malaita who call themselves To'a Ba'ita (big people). This dialect is understood from Fania northward and round the coast to about Coleridge Bay.

Vowels as in French.

"O" as in French "la rose."

"OO" as aw.

"a" a staccato break, a complete opening of the glottis.

"W" and "G" are always nasal in To'a Ba'ita spoken around Malu'u.

"W" as ngw and written nw (ng as in "ring.")

"NG" as ngg, as in "congregation."

"N" as ng, as in "ring."

"Pau" dialect is most widely known in the south of Malaita, from the vicinity of Baunani to the southward through Maramasike passage and up the coast to Manna Kwoi (Manakwai), and down the coast from Pau to several settlements as far as Sulaha, and also at Marau, which is composed of Malaita folk. There are variations according to the district, but these variations are not of any great importance.

"L" and "M" are in most cases interchangeable, the natives being unable to distinguish between them.

English.	To'a Ba'ita.	Pau.
Active.....	Se'emambe.....	Lape marohi.
All.....	'Oro; ni sui bana.....	ahutana; liki mana.
Anchor.....	Ngwalu (n); 'arufigwalu (v).....	Huna.
And.....	Ma; bifa.....	Na.
Arrow.....	Io rarabulu (fish bone barb).....	Ooto.
Ascend.....	Ta'e.....	Hane; tae rae.
Ask.....	Soeto'ona.....	Poi oto nana; pola.
As.....	Matau.....	Ira.
Back.....	Sulla; (sulina, his back) (n).....	Kosuna.
Bad.....	Ta'aa.....	Ta'aa.
Bag.....	Wa'i.....	Ma'i.
Bamboo.....	Ofi.....	Au.
Banana.....	Bau.....	Husi.
Bay.....	Su'u.....	Su'u.
Beach.....	Sullone (on the sand).....	Sulla one.
Bird.....	Tha'aro.....	Manu.
Black.....	Bombora'a; bumbulu'a.....	Poporaa.
Body.....	Se'e.....	Lape—Ku (my), mu (thy), na (his), (suffixes).
Bottle.....	Bumbulu (same word for star, bead, and glass).	Pasi.
Bow.....	Basi.....	Mera mane.
Boy.....	Nwela nwane.....	Ola (stick); mousia (rope).
Break.....	Casia; 'oea; musia; seliaa (v).....	Torea; ho'ua; huaa; mai.
Bring.....	Nalia; mai.....	Asi-ku; wa'ku (my).
Brother.....	Do'ora (man's brother); wai waena (woman's brother).	Holla.
Buy.....	Usia; folia.....	Maku; sara.
Calico.....	Maku; thala.....	Heheraa.
Camp (n).....	Toaa.....	Oni.
Camp (v).....	Too (stop); mai (stay).....	Iora; irora; ia'o (large).
Canoe.....	Iola (small); baru (large).....	Na ma laea.
Can not.....	Dora 'ania.....	Alaha ana haka.
Captain.....	Ara'i ana faka.....	Te'i ana.
Capture (v).....	Kania; Kanlana.....	English word used.
Cartridge.....	English word used.....	alaha.
Chief.....	Nwane inoto; filfil niwane.....	To'oni.
Clothes.....	Maku; to'oni ki.....	Bwaha (over mountains); lolo toma (over sea).
Cloud.....	Datha.....	Si'a; supi.
Club.....	Alafolo; di'a.....	Niu.
Coconut (tree).....	Niu; kollo.....	Lotoinu; bwari'i niu.
Coconut (nut).....	Fa niu; fa kollo.....	La mai; lae mai.
Come.....	Lae mai.....	Suraa (roast); hahia (in stones).
Cook.....	Naarea.....	Kau; hau alina.
Coral.....	Lande; fau buli.....	Huasa.
Crocodile.....	Makwa toro.....	Kakare; lapo'o.
Cup.....	Titi'u.....	Tapalis (with one hand).
Cut.....	Furla; kasia; kwa'emusia.....	Tohua (with two hands).
Cut down (tree).....	Kasia.....	
Dangerous.....	Mamaelia.....	Poni; lodo.
Dark.....	Rondo; rorondo'a.....	Pore.
Daughter.....	Thaari'i.....	Siri'ina.
Day, to.....	Imbaare; itara'ena.....	Lahore'e; idani.
to-morrow.....	'Usunandi.....	Naponi.
yesterday.....	Iro'o.....	Matawa.
Deep (water).....	Matakwa (n).....	Laena hai; tauna hana; laena hana.
Desire.....	Thathamla (v).....	Mae.
Die.....	Mae.....	Ha'a tau; liri'i.
Distant.....	Da; tau.....	Taua.
Do.....	Iila; andea.....	Mane ni ha'a mauria.
Doctor.....	Nwane ni fa'amaruki.....	
	Nwane ni sulu (native).....	Usu kui.
Dog.....	Koi to; Kui.....	

Vocabulary of dialects used in Mala or Malaita Island, Solomon Group—Con.

English.	To'a Ba'ita.	Pau.
Don't know	Si thai to'omana.	Na ma laee; na ke manatainia.
I	Nau kwasi thai to'omana.	
You	Nau 'osi thai to'omana.	
He	Nia 'e a'i thai to'omana.	
We	Kusi thai to'omana.	
	Musi thai to'omana.	
They	Keai thai to'omana.	
Don't	To'ana.	Konia (leave it!).
Drink	Ku'u; ku'ufia.	Ko'u; kouha.
Drum	'O'o; su'ari (wooden).	O'o.
Dry	Rara'ies.	Ake ake; a'a te.
Dwell	To; mai.	Oni onl.
Earth	Fanua ne'i iano; tha'engano.	Hanua mai hua; makano (ground).
East	Ta'elana thato.	Maana lato.
Eat	'Ania; fa'ia; re'e.	Hana; ania.
Enclosure	Kamena.	Heo; tasa; tata; ere.
Evening	Tha'ulafia.	Lanlahe.
Eye	Maa.	Maa.
Face	Maa.	Maa-ku, mu, na (suffixes).
Fall	'Aru; 'asia (reflexive).	Hu, teka.
Father	Maka.	Mama-na, ku, mu (suffixes).
Fear	Ma'u (v); ma'ulas (n).	E mau.
Fight	Firu.	Haeara, haehorol.
Find	Rofeto 'ona; fulato'ona.	Siohia.
Finished	Sui na'a; sui bo na'a.	Siko; mano.
Fire	Era.	Suna.
Fish	Ngwa i'a.	I'a; ai'a.
Flag	Maku (calico).	
Food	Fana.	Hanaraa.
Foot	'Ae; 'a'ae.	A'e-ku, mu, na (suffixes).
Forbid	Lufia.	Luia.
Forget	Liona dora 'ania (his throat can't) Seat of memory in the throat.	Aripunosia.
Fowl	Tha'aro; kukua; kakaraikua.	Kua; kua kua.
Friend	Ruana.	Maehoe.
Fruit	Fo'endo; foana 'ai.	Lotowa'ai.
Full	Fufu.	Honu.
Garden	Ambumbua; ra; 'o'ole.	Ano; haki'i.
Girl	Thaari'i: Ewela kini.	Keni hauru; pire.
Give	Falea.	Watea nia.
Go	Lae.	Lae; la waa.
God	Ara'i Lo (Master above).	
Good	Le'a.	Slani.
Government, The	English word always used.	English word always used.
Grass	Lolo; tataliolo.	Haki'i.
Great deal	'Oro; fa'ama'u.	Iwera.
Grow	Ta'e.	E pito.
Guide (n)	Nwane ni talala.	Haatainia tara; tarala.
Guide (v)	Talala; tolea.	
Harbour	Su'u (corner).	Su'u.
Hatchet	Iroma; kiki'a.	Ira; hou rapu rapu.
Have, take, get	Alua; Halia.	Ho'ua; luka'asia; torea.
He	Nia.	Inaia.
Head	Ngwau.	Pau-ku, mu, na (suffixes).
Heavy	Kulua.	Hi'a; kuru'a.
Here	Ku ne'i.	Nenf; nene'e.
Hill	Ngwa tolo.	Iire; tolo.
His, hers	Nia (follows noun).	Naia (follows noun).
House	Bi'u; luma; fera.	Nima.
House, sacred	Bi'u ambu.	Nima apu.
How	Ni fa na ma'alutana.	Taita.
How much	Fita.	Hita.
Hungry	Tha'ofa.	Mahea; hloro.
Hut	Luma; bi'u; fera.	Nima; nima ni rora (canoe house).
I	Nau.	Nau.
Ill	Mata'i.	Mata'i; kiruha.
Inside	Ilaa; Ilaia.	Laona.
Island	Kokumua.	Mara-marau.
Kill	Thau'ia.	Horoia; bwaia.
Knee	Ururana.	Ururana.
Knot	Ngufigu.	Paupaua.
Know	Thai to'omana.	Raea; laea.
Lagoon	Ngwa; kiki'mboa.	
Land	Fanua.	Hanua.
From a boat	Sifo.	Lae hlapa.
Large	Ba'ita.	Palna.
Laugh	Waala; silele.	Mai masi (v); masiha (n).
Laxy	Se'e dandaola.	Larawa'a.
Lead	Tolea; talala (v).	Tarala; torea.
Leaf	'Ambana 'ai (hand of tree).	Apa apana 'ai.
Leave alone	'Ekwa 'ania; 'akwasia.	Konia hau; luka'asia.
Left hand	'Amba maufi.	Kai Kai mae; Kai Kai mouli.
Leg	'Ae; 'a'ae.	'Ae.

Vocabulary of dialects used in Mala or Malatta Island, Solomon Group—Con.

English.	To'a Ba'ita.	Pau.
Letter.....	Leta (English word).....	Kae; kaeha.
Lie (untruth).....	Lolalaa.....	Eno; enohua.
Lie down.....	Te'o; vari.....	Mauriha.
Life.....	Marukia.....	Uunu.
Light (n).....	La'aofa; la'afa; kwethu.....	Tarama inia.
Light (v).....	La'afa; so'onfa.....	Hena.
Lime.....	Fena.....	Noroa.
Lime (fruit).....	Moll.....	Lio; lesia.
Listen.....	Bo'oa.....	Mane; are mane.
Look.....	Ljo; rikia.....	Mane.
Magistrate.....	Nwane inoto government.....	Omo; koa.
Male.....	Nwane; do fiwane.....	Iwera.
Man.....	Nwane.....	Au.
Mangrove.....	Ko'a.....	Alaha.
Many.....	'Oro.....	Too hua; too mane.
Mast.....	'Al.....	Suna.
Master.....	Nwane inoto.....	Are nau (my thing).
Marry.....	Folekini; to'owane.....	English word.
Match (light).....	Era.....	English word.
Mine.....	Do nau (my thing).....	Warowaro; hura.
Mission.....	English word, or sukulu (school).....	Lalisi; ho'oa.
Missionary.....	English word.....	Nike-ku, mu, na (suffixes).
Moon.....	Mandame.....	Ire.
Morning.....	'U'usu'fandi.....	Owana (his mouth), nusuna (his lips)
Mother.....	Thaina.....	preferred, more polite.
Mountain.....	Ngwa tobo ba'ita.....	Owaku (my mouth).
Mouth.....	Foko (It is a deadly insult to say fokomu (your mouth)).	Lata-ku, mu, na (suffixes).
Name.....	Thata.....	Hure, hu'o.
Net (fishing).....	Furei.....	Hauru.
New.....	Faalu.....	Poni ai; me'e dani.
Night.....	Fa rondo.....	E mao.
No.....	'E a'i.....	Lelehono (v); nehonoha (n).
Noise.....	Alifeolia.....	Ua ho; no'o warita.
Officer.....	Nwane nira'ana government; ara'l.....	Moutel.
Olden time.....	Ina'o mai; dini; 'wina'o.....	Are eru (plu) (thing ours); are eroa
Only.....	Talito'ona; talifilia.....	(dual).
Ours (exclusive).....	Kamili'a (plu); Kamare'a (dual).....	Hote.
Paddle, a.....	Fote.....	Haluta; hotea.
Paddle, to.....	Faluta.....	Hi; bwa'i.
Palm.....	Fi (v); se'efia (n).....	Horia.
Pay.....	Uia.....	Oni 'oni lohu (stop quiet).
Payment.....	Ufilana.....	Lo'a.
Peace.....	Enolaa.....	Inoni.
Pearl shell.....	Sengo.....	Mani; nihi.
Person (any).....	Al; Imole.....	Po.
Piece.....	Shi.....	Urau; kukumu.
Pig.....	Bo'tho.....	Ipaipa (corruption).
Pigeon.....	Bola.....	Lih; nihi (n); konia; kosia (v).
Pineapple.....	Ba inafu.....	Hal ara.
Pipe.....	Bimbi ala.....	Lee sianha; laena mano.
Place.....	Kula (n); alua (v).....	Nonora.
Plantation (coconut).....	O'ole'e nu.....	
Play.....	Kakale.....	
Placed.....	'E le'a iana (it good to him).....	
Point (cape).....	Nonoras.....	
Police.....	Omea government.....	
Police officer.....	Ara'l omea government.....	
Porpoise.....	Kirio.....	
Potato (sweet).....	Kai ro'ngi.....	
Pour.....	Lulaa; Kikia.....	
Power.....	Suukwa'ia.....	
Prisoner.....	Nwane na kera kanfa (man they shut up).....	
Pull.....	Ra'u'ania.....	
Quickly.....	Fofa'a; lakwalakwa.....	
Rain.....	Dani.....	
Rat.....	Ga'ufa; gu'a; asufa.....	
Red.....	Memena'a.....	
Reef (coral).....	Mai.....	
Refuse (reject).....	Tofaa.....	
Rejoice.....	Se'ethathala.....	
Relations.....	Inalana kera.....	
Return.....	Oli mai.....	
Rifle.....	Kwa'ia.....	
Right hand.....	'Ambe' sola.....	
Ripe.....	Kwatho.....	
River.....	Kafo; kafo ba'ita.....	
Road.....	Tala.....	
Rope.....	Afofa; 'oko.....	
		Ukumia.
		Labwohia !; hai ore !.
		Uta nemo.
		Asuhe.
		Nonorohia; memena.
		Mai.
		Hutaa Inau.
		Oli mai; a puro mai.
		Suta (corruption).
		Kai kai uu'i; kai kai mauri.
		Maelo.
		Wai; kahu.
		Tala.
		Bwaro; iari (ship's rope).

Vocabulary of dialects used in Mala or Malaita Island, Solomon Group—Con.

English.	To'a Ba'ita.	Pau.
Row (with oar).....	Faluta.	Hotea.
Rudder.....	Fita.	Al huru hurua.
Run.....	Ambu.	Huru; oro.
Sacred.....	Kaufa; balata'i.	Ma'i; apu.
Sail (n).....	Nwane 'amali; nwane asi.	Pana.
Sailor.....	(No noun); (adj.) amallia.	Mane asi.
Salt.....	Busu.	Asi ahaa.
Sandbank.....	(With food) Ambusu.	One a'ate.
Satisfied.....	Sukulu (corrupted).	Bote.
School.....	Sorea.	Na'a hana; na'a hihl.
Sold.....	'Amali; asi.	Asi.
Sea.....	'Amali maruki (live).	Asi kai ta'ara.
Sea (rough).....	Rika.	Lesia.
See.....	Rofea; rofe uria.	Lio obia.
Seek.....	Arasia.	Eroa.
Sand.....	Tetea.	Sara.
Shallow (water).....	Ba'ekwa.	Baewa.
Shark.....	Faka.	Haka.
Ship.....	English word or faka ba'ita (big).	
Ship (man-of-war).....	English word or faka fa'ekwa (little).	
Ship (trading schooner).....	Basi.	Otomia (with spear); han asia (arrows); sutaa (gun).
Shoot.....	Nufuru.	Kokoosu.
Short.....	Ngwana 'aribana.	Pau araha-ku, mu, na (suffixes).
Shoulder.....	Suufi; 'al.	Laka; poiaina.
Shout.....	Faata'ina.	Haataina.
Show.....	I ninihana.	Popona; ririna.
Side (by the).....	Mata'i.	Matal; siroaha.
Sick.....	Fatalaa.	
Sign (n).....	Thuthu; kuthu.	Toto.
Sink.....	Wal waena (man's); do'ora (woman's).	Hahone-ku (etc.) opposite sex (a man's sister or a woman's brother).
Sister.....	'Ono.	To'oru.
Sit.....	Una.	Hoho'ana; sisimana.
Skin.....	Thalo lo.	Lero.
Sky.....	Bifia; maleu; mo'osu.	Ma'ahu; ma'asu.
Sleep.....	Fa'ekwa.	Masike; masi'e.
Small.....	Makwa.	Wasu; si'ini.
Smell (n).....	Ka makwafi naw (it smells me).	E si'ini nau ta'aa (it smells to me bad).
Smell (v).....	Thasu (n. and v.).	Rasu.
Smoke.....	Nwane ni firil.	Mane ni mae.
Soldier.....	Kalufiwani.	Kale-na (etc.).
Son.....	Fafu.	Kana; nuha.
Song.....	Nata; ba'e; soera; tamanl.	Na'a; leho; iria; arahu.
Speak.....	Sua.	Noma; sua.
Spear.....	Natalaa; ba'elaa.	Walana; wala.
Speech (language).....	A no'ando.	Hiona; anana; aneaniare.
Spirit (ghost).....	Takwe; takwe iaa.	Ura.
Stand up.....	Bumbulu.	Puru puru; pou pou.
Star.....	Billa; laua.	Pell.
Steal.....	Atho; athomia.	Taepuri.
tear.....	'Al; kumba'u.	Al; hapa; ape'a.
Stick (n).....	Rakana.	Opama-ku (etc.).
Stomach.....	Fau.	Hau; kasla.
Stone.....	To; su'usia (hinder).	Oni; rararia (hinder).
Stop.....	Bi'u falli; fae lanl.	Duru; dusu.
Storehouse.....	English word used.	English word used.
Store traders.....	Kokoto.	Ododo.
Straight.....	Kwa'ea; kumua.	Rapusia.
Strike.....	Ahota; kwa'o.	Bwara; hakano.
String.....	Suukwa'i.	Letea; tanca; okila.
Strong.....	Maariko.	Hinasu.
Substance (flesh).....	Thato.	Lato.
Sun.....	'Arana.	Para'au.
Swim.....	Nalla.	Ho'ua.
Take.....	Alo.	Alo, hui.
Taro.....	To'oa; kwalfi'amanatal.	Ha'asuria.
Teach.....	Kera; do kera.	Are kira.
Theirs.....	Ill.	Uri-hau; uri-wou.
There.....	Kera; kilu.	Kira.
They.....	Refo'a; ngafigoro'a (person).	Sull hata'a.
Thin.....	'Oe; do'oe.	'Oe; are o (thing thy).
Thine.....	Do; al (a previously mentioned thing).	Are.
Thing.....	Manatato'ona.	Nifrae ana; manatasiona (think about).
Think.....	Ne'i.	Neme'e; ne'e.
This.....	'Oe.	Oi; o.
Thou.....	Lio luana.	Ato ato-ku (etc.); (mention of the throat is very insulting).
Throat.....		Uha; he'etaina.
Throw.....	'U 'ania; nana 'ania.	Ura'ania.
Throw away.....	'U 'ania; nana 'ania.	Urihe; uri'i.
Thus.....	'Una 'eri.	Lua.
Tide.....	Lua.	

Vocabulary of dialects used in Mala or Malaita Island, Solomon Group—Con.

English.	To'a Ba'ita.	Pau.
Time.....	Maña.....	Horoa; lo'ua.
Tobacco.....	Firi.....	Mapuru.
Toe.....	Kukul 'ae.....	U'uma a'ena.
Tongue.....	Mee.....	Mee-ku (etc.).
Tooth.....	Lifo.....	Nho.
Touch.....	Suana; sua.....	Su'umia.
Track.....	Sules (v); tala (n).....	Tala.
Tree.....	'Al.....	'Al.
True.....	Mamana.....	Waraimori.
Turtle.....	Fonu.....	Honu.
Two days hence.....	I tafone.....	Uhure'e.
Uncle.....	Lukea; lukaia.....	Hoea.
Untrue.....	'E a' i si mamana (he not true).....	Kaeha lipoa; motha.
Village.....	Tosa.....	Heheraa.
Visitor.....	Nwane fula.....	Huraha.
Voyage (to go on).....	Liliu ilaa amali.....	Lae pabe.
Walk.....	Lae.....	La'au.
Walk about.....	Liliu.....	Laha; la hai lin.
War.....	Firulaa.....	Mae; ohoha.
Waah.....	Taus; sisu (the body).....	Loto.
Watch (v).....	To kinakina; betaa.....	Ahorosila; ahorosi.
Water.....	Kafo.....	Kahu; karusi; wai.
Wave (breaker).....	Lua.....	Naho.
We.....	Kulu (inclusive); kamili'a (exclusive).....	Kulu.
Weak.....	Fenda; maketho.....	Atoli.
West.....	Sifolana thato.....	Lato e sun.
Wet.....	Ngwina.....	Ora; pisua (damp).
What.....	Ta ?; ta si ta ?.....	Ta ?; eta ?
Where.....	Ihei.....	Hei; ihei ?; tai hei ?
Which.....	Do ta.....	Are irihei ? (which one); utas.
White.....	Kwao; kwakwao'a.....	Paraparaha.
Who.....	Ni tai.....	A tai.
Widow.....	Ngwa oru.....	Nao.
Wind.....	Thauthau.....	Oru.
Wind northwest.....	Kumburu.....	Kopuru; aworosi.
Wind southeast.....		An.
Woman.....	Kini; ai.....	Hua; huka.
Wont.....	Lalakwa.....	Na si taua ! (I don't want to).
Wound.....	Maala.....	Kita.
Yam.....	Kai; ui.....	Uhi.
Yes.....	Iu; ua io.....	A'a; sha.
Yesterday.....	I ro'o.....	Naponi.
You.....	K'amulu.....	Ol; o.
Young man.....	Nwane hii ba'ita.....	Nanau; sanau.
Yours.....	Do Kamulu'a.....	Are lauru.

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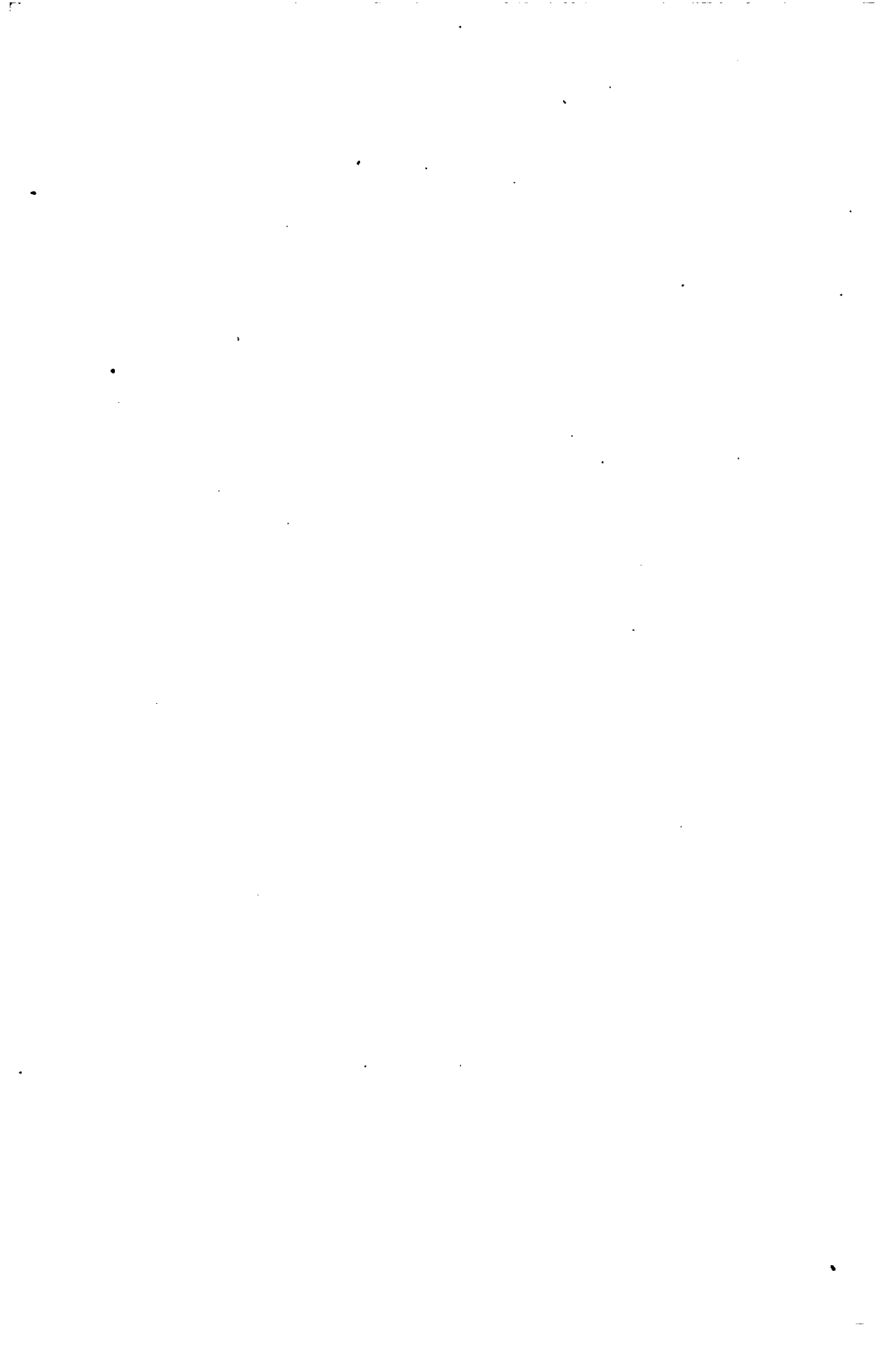
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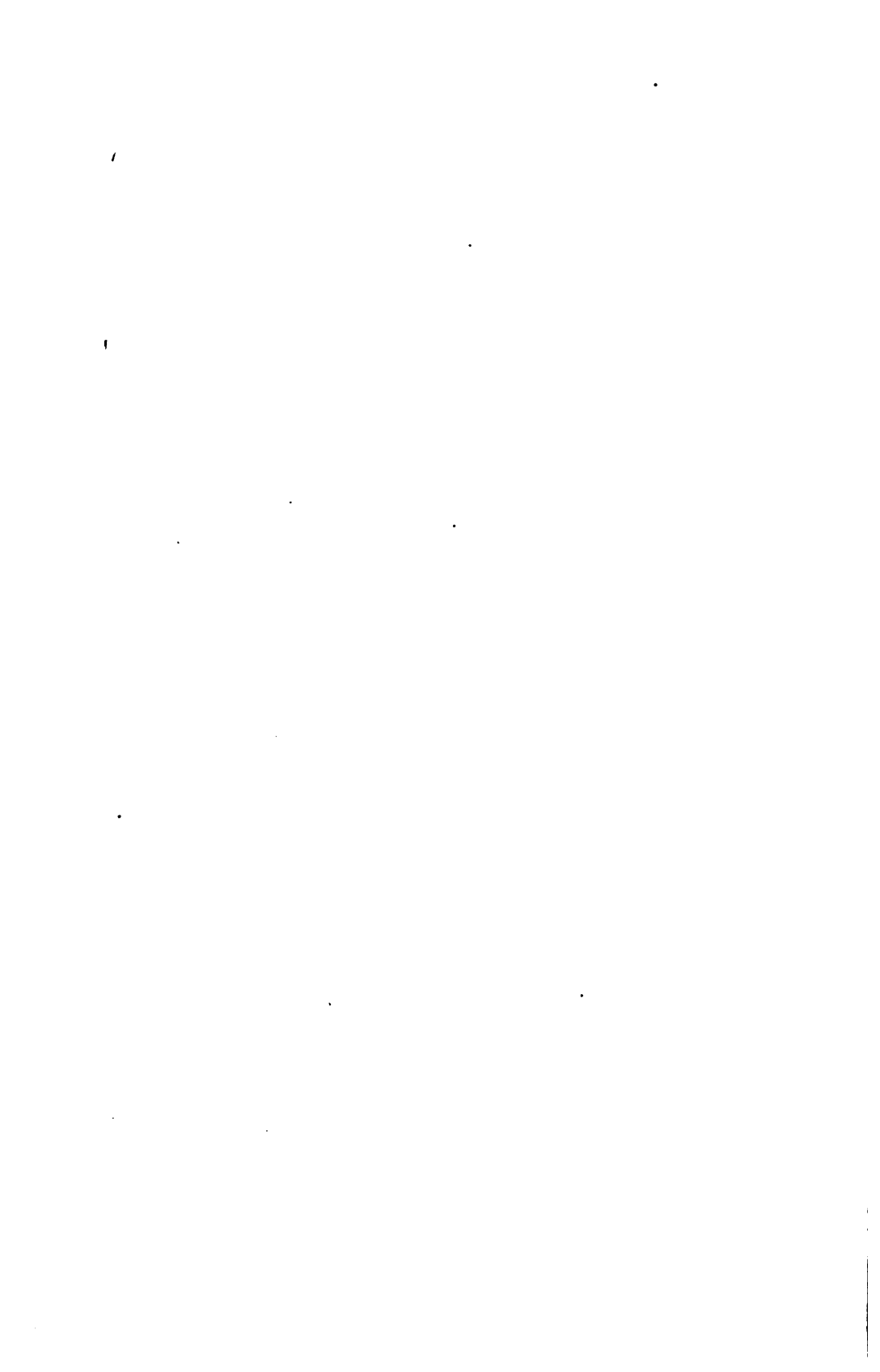
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